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The Standard Voting Machine.

We have referred in previous issues to the work of the Standard voting machine, and have recently had an opportunity of carefully examining it. This examination has confirmed our previous good opinion of it. Both from the standpoint of a citizen interested from its inception in ballot reform, and from that of a mechanic interested in new mechanical devices and methods, we find the machine admirable. So far as we can see, it completely safeguards the ballot; *i. e.*, it enables any elector to readily vote as he intends or desires to vote; he need not let anyone know how he has voted; no one can ascertain or know how he votes; vote buyers must take the word of vote sellers as to how the purchased vote was cast; the voter may be certain that his vote will be counted; that the danger of its being nullified by fraudulent votes will be reduced (the machine has nothing to do with registration frauds), and that when the voting ceases the result will be known very much sooner than now and with practically no chance of mistake nor opportunity for "manipulation." In addition to this, the voting is more rapidly performed, and as tickets do not have to be printed and other expenses are saved, the machine results in a net saving of something like 20 per cent. of its cost each year.

In other words, it may be expected to pay for itself in about five years, and so far as we can see, unless tools of some kind are used upon it for the purpose of breaking it, it will last more than five times that long; and in fact we should expect the machines, with such care as could easily be given them, to last and continue to give good service indefinitely. The duty required of any one mechanical detail of the machine must, in the nature of the case, be slight—far less than is regularly expected and required of similar details in other machines, and we can see no reason to apprehend that the machine may fail in any way. Of course, it may be wrecked or broken intentionally, but from such abuse the law and its officers must protect it, while the possession of a few extra machines in each city or district, ready to be set up and used promptly in place of an injured one, will not only prevent anyone being disfranchised, but will, of course, have a deterrent influence upon those who might be disposed to resort to violent means.

The Address of Coleman Sellers.

There could be no better living authority upon the history of the development of modern machinery, the invention and continued improvement of machine tools, and the phenomenal growth of the machine industry, than one who can say, as does Mr. Coleman Sellers in the address which we finish in this issue, that the birth of the steam locomotive was coincident with his own birth, and that the planing machi e is an invention well within his own experience. Mr. Sellers is a mechanic born, as well as one from his birth associated with machinery, and whose life work has been all in the interest of machinery and engineering. In addition to this, he has the ability, trained and practiced, to tell in concise, direct and yet attractive style whatever he sets out to narrate. He does not waste words, and the present paper is so long simply because he had so much to say. It is only to be regretted that it is not longer, or it is rather to be hoped that the future may be enriched by him with additional contributions to the history of mechanical progress.

The Leading American Workmen.

In "The Engineer" of January 26 is a notable article entitled "American Versus British Workmen." The article is evidently the work of a man well acquainted with industrial conditions in both countries, and his remarks on the subjects of climatic and social influences are interesting, and we think, on the whole, well founded.

On one point, however, we cannot agree with him entirely, though he has plenty of other support for his view. He states, what has so often been stated before, that the best workmen in America and those who fill the responsible positions are British, and we do not believe that is true. It is true, perhaps, in certain lines of work, but in those lines which are specially developed here and which, as we have said before, have borne the most prominent part in the development of our foreign trade, we are quite certain it is not true, but that rather the reverse is true.

In machine manufacturing operations, in such work as is done in small-arms, sewing machine, bicycle or typewriter factories, neither British nor other foreign workmen go ahead of American ones. British workmen in such factories are recognized as good vise hands; they can chip and file accurately and rapidly; but the ability to do this does not count for everything in an American factory, and to say that foreign workmen take the lead in the tool work and special machine construction that lie at the basis of our success as a manufacturing nation would be to ignore the facts and to make one's self ridiculous.

The trouble with the statement as made is that it is too general, and like most general statements, it is untrue or is only partially true. British blacksmiths, for instance, are apt to be highly skilled men—the best of their class, and in certain lines of machine work the best men will often be found to be English or Scotch; but that the same is true of all machine shops here we deny, and we know that in those lines of work carried on here which differ most from the work of other countries, and which have given us most of our prominence in foreign markets, Americans generally lead and do the best work.

Threatened with a Libel Suit.

The "Reliance Oil and Grease Company," of Cleveland, Ohio, take exception to our remarks regarding their methods of doing business, published in our issue f January 18, and declare their intention to immediately bring suit against us for libel, and to "make this an interesting matter for you [the "American Machinist"] unless we get immediate satisfaction." Said satisfaction is to consist of the prompt publication of a "full retraction." We shall, of course, publish nothing of the kind.

Our readers will acquit us in advance of the charge of publishing matter of this kind without having any evidence on which to base our statements, and the evidence in this case consists of a large number of letters addressed to various oil purchasers and users, offering, always, the exact same amount of oil, which has always been shipped to a point near the person addressed to a consignee whose "unsatisfactory financial standing" was not discovered until after the oil was on its way.

These letters bear evidence of having been printed or manufactured in imitation of typewriter work. Numbers of them are duplicates in every minute particular, and are usually signed by "J. M. Bachert, Mgr.," the name being stamped or printed upon the letter in imitation of a pen signature. The inference would be that so many shipments consisting of

"2 bbl 'Electric' Engine Oil,
1 bbl 'Marine' Cylinder Oil"

are made by "the Reliance Oil and Grease Company" to irresponsible parties all over the country that the letters offering these unfortunate small lots of oil have to be made and signed by some wholesale process. Our readers can draw their own conclusions as to whether our remarks about this business were or were not well founded and as to the likelihood of our publishing "an immediate and full retraction."

We await the impending suit, and in the meantime the "American Machinist" will appear weekly as usual.

The Sibley Oil & Grease Manufacturing Company, Cleveland, Ohio, addressed a letter to the Passaic Steam Laundry Company, Passaic, N. J., in which they stated that they had at Madison, N. J., one half barrel of Premium cylinder oil, which they wished to dispose of immediately to avoid its being sent to "unclaimed freight station." This is a little variation from the "near you" location, and the treasurer of the Passaic Steam Laundry Company, who happens to be a reader of our paper, wrote to the station agent of the Delaware, Lackawanna & Western Railroad at Madison, N. J., asking him if he had on hand or had received from the Sibley Oil & Grease Company any s ch package of oil, and he replied under date of January 22 that there was nothing of the kind there. Of course, Mr. Casebolt did not expect that there would be, but thought he would inquire to confirm his doubt, so to speak; and we hereby give notice to the Cleveland oil swindlers that there is no use trying to victimize the Passaic Steam Laundry Company, notwithstanding that their title does not indicate that they know of the "American Machinist."

"The Mechanical World," London, in speaking of the discussions of technical papers in the engineering societies has the following to say: "We should be inclined to ascribe the apparent attitude of mute acquiescence with which American papers are generally received, as pointing rather to a desire to learn as much as possible, without giving anything away which might be turned to account by competitors in business." This is too absurd to admit of discussion. No professional men on earth have fewer professional secrets, or are more ready to have the world know all they do and how they do it, and, what is just as important, the speed at which they do it, than American mechanical engineers. The following also is said by our contemporary: "So far as concerns the discussions of the papers read before the American Society of Mechanical Engineers, it seems to us that the required formal notification of a member's intention to take part in a discussion has much to do with the limitation of interchange of ideas." This shows an entire misunderstanding and consequent misrepresentation of a very simple thing. There is absolutely no requirement of notification, formal or otherwise. Members are simply invited to send in notice of their intention to participate in discussion as a means of securing precedence over those who do not send such notice, but when the discussions occur they are open to any competent man, and most of those who take part have not previously sent notice of an intention to do so.

Personal.

Frederick A. Scheffler has resigned his position as general factory manager for the Sprague Electric Company.

G. H. Gregory, formerly of Oakland City, Ind., has become master mechanic of the Pinkney Mining Company, Pinkney, Tenn.

Mr. Charles H. Brown, of the firm of C. H. Brown & Co., Fitchburg, Mass., has retired from that concern, and it will be hereafter carried on by his sons, Messrs. Charles H. Brown, Jr., and Frank E. Brown. The Brown engine has made a name for itself and for its builder, which is in many respects unique, and it is probable that no more conscientious and painstaking engine builder ever carried on business than Mr. Brown has been. His engines have been noted for the superlative excellence of their workmanship. His retirement from the business is therefore a noteworthy event. He leaves to his sons not only a business but an excellent reputation, which it is hoped they will fully maintain.

Obituary.

Leander J. McCormick, son of Robert McCormick, the original inventor of the McCormick reaper, and younger brother of Cyrus H. McCormick, whose name was most prominently associated with its phenomenal success, died in Chicago, February 20, eighty-one years old. He was born in Virginia, and at an early age became associated with his father in the manufacture of the reaper. In 1847 he and his brother were established in Cincinnati, and in the following year the business was transferred to Chicago. Leander had full charge of the manufacturing department, making many inventions and improvements. He retained the supervision until the incorporation of the McCormick Harvesting Machine Company, in 1879, and only retired from active participation in the management in 1889. In 1871 he gave to the University of Virginia an observatory and the then largest telescope in the world.

Education and Training.

Francis H. Richards, in his presidential address delivered before the American Association of Inventors and Manufacturers at Washington, said:

"Education properly includes both learning and training, all experience whereby one's powers are extended and disciplined; it continues through life and is not restricted to the period of youth. It has become the duty of everyone to learn something more every day. This, perhaps, suggests the true reason for the decadence of the apprentice system—a change which, after all, may be merely the extension of a truer apprenticeship to the whole duration of one's working years.

"Not so very long ago all labor was classified as skilled or unskilled. Above the skilled labor zone, on the one side, were the professions, with an impassable gulf between; while below were the peasantry classes, untrained and non-progressive. All this has changed; the wide chasm has been bridged. The laborer, possessing both skill and training, now exercises professional powers; he stands shoulder to shoulder with—in every just sense the equal of—the professional man and the scholar. Professions and trades, handicrafts and vocations, have been multiplied and a new classification of the laborers is necessary. Can we not fairly designate them 'professional,' 'expert,' 'skilled,' 'trained,' 'untrained'?"

We would like the name and address of the present maker of the "Hackney" hammer.

Commercial Review.

NEW YORK, SATURDAY EVENING, February 24, 1900.

DYNAMOS AND MOTORS.

Whoever thinks the mainspring of business has been going so long that it must be running down by this time will be at a loss to explain some of the signs of activity that confront him in the electrical machinery market. Representative companies report orders as holding their own, or even on the increase, and factory facilities are constantly being extended. At the same time deliveries of machines have gradually become easier, and materials are obtained with less trouble than they were. Prices of dynamos and motors are no longer on the "qui vive," and some of the supplies for their manufacture, such as copper and mica, are falling in cost.

The General Electric Company is contemplating the erection at Schenectady of a steel foundry. The steel castings it uses at its Schenectady plant are now either brought from the Lynn works or purchased from outside foundries. The General Electric has lately been asked to furnish 500 motors (250 car equipments) to the Metropolitan Street Railway Company of this city. The General Electric Company's foreign business, since the first of the year, both at home and abroad, has been heavy.

The Crocker-Wheeler Electric Company has just sold three 80 horse-power motors to the "New York Journal" for driving printing presses. Business from their standpoint looks about as good as at any time hitherto.

The C & C Electric Company has put on about twenty-five new men in its shops in the last two months, and now has a force numbering upward of 200. The company has sold a good many machines for export in the last few days, running chiefly in motors of 5 to 15 horse-power.

The Northern Electrical Manufacturing Company is stated to have made an increase in prices February 17.

An electrical machinery seller of this city, who is otherwise extremely busy, says that there is very little isolated plant work for local buildings to bid on at present.

EUROPEAN BUSINESS CONDITIONS AS OBSERVED BY MR. MONTGOMERY.

George T. Montgomery, of the tool and supply firm of Montgomery & Co., New York, has returned from his semi-annual business trip to Europe. He spent several weeks in France and visited England and Switzerland. He found trade conditions abroad dull with some manufacturers, but booming with others. The Geneva Electric Company, for instance, has orders enough on hand for motors and other products to keep it busy for a year. Business in Europe possesses elements of stability which promise a prolongation of activity. It is not a reflex of the American boom, but is based on orders coming from Europe itself, and from the far East, Australia, South America, etc. South America is getting to be quite an important market for France.

The automobile industry on the Continent is enlisting much new capital, and is rapidly expanding. In the course of six or seven months it may be expected to attain a high point in its career.

Prices of iron and steel products have risen about as much in Europe as in America, so that buyers who would complain of American advances are silenced Whether values have yet attained their maximum abroad Mr. Montgomery regards as beyond confident opinion.

The machinery building of the exposition at Paris had not taken on a shop-like appearance when Mr. Montgomery visited it, as the bulk of the machinery yet awaited installation. One evidence of the fact that preparations for the fair were being made was the large number of foreigners to be seen in Paris. There are said to be 10,000 who have come there to work upon foreign buildings and for kindred purposes.

About the South African war there was less talk in England than in France and America. The business men encountered were not apt to allude to the subject unless it was brought before them.

The imitation of American tools in Germany is becoming an increasingly patent fact. One of the English firms handling American tools which was called upon by Mr. Montgomery has lately received from a German manufacturing concern, believed to be a new enterprise, a circular offering a line of lathes made by them, which they claimed to be similar to tools of American design, and which indeed were obviously patterned after a certain lathe made here. Further, they offered to build special imitations of American tools to order if required in quantities of profitable size. The English dealer had too much loyalty to his American friends to avail himself of the proposal. The imitators of our machines sometimes offer them at prices almost 50 per cent. below those of the originals. Some of these copied American tools, although identical in design with the real article, are of a much rougher finish, the castings looking as if they had been dressed off with a cold chisel.

The Usines Metallurgiques de Vallorbe, which have a store at 28 Boulevard Magenta, Paris, and which are the foreign house corresponding to Montgomery & Co. in America, have just published in French a large catalog chiefly of American tools.

VARIOUS NEWS AND COMMENTS.

A new automobile manufacturing enterprise which has the appearance of being among the more substantial of the hundreds that have come into being, is the National Automobile and Electric Company, of Indianapolis, recently chartered, with a capital of $250,000. Mr. L. S. Dow, former secretary and general manager of the Indiana Bicycle Company, is president and general manager, and Arthur C. Newby, late president of the Indianapolis Chain and Bicycle Company, is to be prominently identified with the new concern. A factory, with the main building 350x75 feet, will be erected and equipped with electrically driven machinery which has been ordered, and probably 200 men will be given employment. The capacity of the main building is estimated at ten vehicles a week, which, it is said, will put the concern upon the footing of the second largest automobile manufact rer in the United States. Electric vehicles and other electrical appliances will be manufactured. Eventually the construction of non-electric motor vehicles may be taken up.

Another important automobile enterprise has been started at Indianapolis under the leadership of Charles H. Black, carriage manufacturer of that place. It is said that the company is backed by two Eastern capitalists, and plans have been accepted for the erection of a three-story brick building 300x150 feet. A number of export orders are already on hand. Mr. Black is himself the inventor of an automobile which it is asserted will carry a weight of 800 or 1,000 pounds on a smooth road at the rate of twenty-five miles an hour. Still another automobile factory is to be built at Indianapolis by the Parry brothers.

PROPOSED APPROPRIATIONS FOR NAVAL EQUIPMENT WITH MACHINERY.

From the naval appropriation bill under consideration by the naval committee of the House of Representatives the following items are taken as of interest to machinery, especially machine tool, manufacturers:

Navy Yard, Mare Island, Cal.—Tools, $5,000; foundry for construction and repair, $4,500; pattern shop for do., $6,000; electric work, $12,000. Naval Station, Puget Sound, Washington—Crane to be located on wharf, $5,000; equipment shop, $85,000. Naval Station, San Juan, P. R.—Electric light plant, $5,000. Navy Yard, Pensacola, Fla.—Crane, $7,500. Navy Yard, Portsmouth, N. H.—Machine shop for equipment, $100,000; steam engineering machine shop, $50,000; smith's shop, construction and repair, $22,000. Navy Yard, Boston.—To start the refitting and improving of the machine shop, $50,000; extending equipment shop, $100,000; machine tools, $5,000; elevators, $10,000; for the construction of a smith's shop, $200,000. Navy Yard, New York—Electric light and power plant, $25,000; for the erection of a pumping plant, $80,000. Navy Yard, League Island.—Complete one pair shear legs, $17,000; electric plant, $20,000; electrical workshop, $84,000; machine shop for steam engineering, $174,000; coppersmith's

shop and foundry, $180,000; blacksmith and boiler shops, $118,000; pattern shop, $61,500; blacksmith's shop for construction and repair, $43,200; plumber's shop and foundry, construction and repair, $103,880. Navy Yard, Washington.—gunner's shop, $80,000; tool shop, $86,000. Navy Yard, Norfolk.—Repairs to machine shop, $60,000; enlarging electric plant, $20,000. Naval Station, Port Royal, S. C.—Repairs of machine shop, $10,000. Naval Station, Key West, Fla.—Construction and repair shop, $50,000. Other appropriations: Machinery plant, Portsmouth Navy Yard, $25,000; machinery plant, Boston Navy Yard, $50,000; machinery plant, Mare Island Navy Yard, $50,000; machinery plant, naval station, Algiers, $25,000; machinery plant, naval station, Honolulu, $25,000; machinery plant, naval station, San Juan, $25,000. For new machinery for the gun plant at the Washington Navy Yard $50,000 is devoted. For machinery for new ordnance shop $100,000 is allowed. It is proposed to give $6,000,000 to the Bureau of Construction and Repair for the purchase of machinery and tools, continuing the construction of vessels on stocks, purchase of miscellaneous articles of equipment, etc., in addition to minor appropriations to that bureau. A particular item included in the bill for steam machinery and repairs thereto is $1,585,000.

CHICAGO MACHINERY MARKET.

In the machinists' supplies trade February is showing little, if any, variation from the phenomenal conditions which for six months have characterized business. As compared with January there is some slight declivity in the volume and perhaps the range of values. But when comparisons are made with the corresponding month last year they sharply favor the business that is now current. There was activity all of last year, but the more favorable showing was made during the latter half of the year. The fever has now been eliminated from the buying. In fact, consumers are generally buying no more goods than they absolutely require for early needs. This normal condition perhaps commends itself to a majority of the trade, and a steady and indefinite continuance as at present would be eminently satisfactory. The absence of purchases to cover future requirements is due in part to the very conservative policy consumers are pursuing in the matter of buying all iron and steel material, under the expectation that values will in the not remote future show some recession, and partly to the fact that the consumers are not quite so heavily burdened with orders. There is no suspension of industrial activities, except as produced by the labor differences in various manufactories and at various centers. The local trade in machinists' supplies at Chicago is just now unfavorably affected by these influences, for there are rumors of further strikes, unless adjustments with the men are quickly concluded. While this naturally affects materially those sellers whose trade here is largely with local buyers, producers and merchants whose trade extends over a considerable area of the country scarcely feel the effects.

There has lately been a wonderful development of the manufactures of Tennessee, as reported by supply houses that reach that State. And throughout Ohio, Indiana and Michigan there have sprung up a multitude of new plants, all of which are now calling for machinery and supplies. One seller says that every day he has orders from two to eight or ten new customers. As long as this expansion of manufacture continues, the future of machinists' supplies seems to be assured. About the only branch that is dull is the bicycle trade. Several years ago when the bicycle trade was so prosperous, the percentage of losses from the failures of bicycle makers was very large, in some instances wiping out all profits. The dullness is therefore not an unmixed evil. Chicago suffers now in this branch, because the buying of the largest bicycle producer is now conducted wholly from New York. The low prices of wheels seem to have discouraged many of the smaller makers. But there are many compensations for this loss. New life has been infused into manufacture generally. Many processes are in an active state of experimentation, with promises of early development. New uses are found for material which has heretofore been pure waste. The impetus is too general to be quickly squelched. And therein lies the basis for the faith in the future.

CINCINNATI MACHINERY MARKET.

The Cincinnati Milling Machine Company has been making tremendous strides in the matter of improvement and adoption of modern ideas. The company will make two exhibits at the Paris Exposition—at Vincennes in the American section and in the Champs de Mars section; 250 square feet of space is reserved in the first and 100 in the second for the display of the various types of machines turned out in the Cincinnati factories. The Vincennes exhibit will be connected with power. Secretary and Treasurer F. A. Geier will be in attendance at the display, and the entire consignment will be under the personal supervision of a man from the local works. A recent acquisition to the office force is Mr. Wood Walters, who has been for many years in charge of the books at the office of the "Commercial Tribune." Mr. Walters will have personal supervision of the books at the Cincinnati Milling Machine Company's plant, and later will become personally interested in the business. "If our business for this year shall prove as good as last we will be satisfied," said Mr. Geier today at the Business Men's Club. The Cincinnati Milling Machine Company is receiving some well merited attention at the hands of the citizens' joint committee on abatement of the smoke nuisance in Cincinnati. This company is the only one in its line that is permanently equipped with the most approved devices for smoke consuming.

Indicative of the demand for machinery in Cincinnati manufacturing establishments the experience of the Cincinnati Spring Works is significant. This concern is working two distinct forces, and overhauling and refitting and replacing every bit of machinery in the plant. The experience of the Cincinnati Spring Works is that of three-fourths the entire local manufacturing territory.

Vice-president and General Manager J. V. Lewis, of the American Tool Works Company has returned from a three-weeks' trip through the Eastern markets. Mr. Lewis kept his eyes open as to business conditions generally, with an especial regard for his company's representation in the Eastern fields. Mr. L. E. Voorheis of the office force notes the greatest demand for planers, drills and lathes, and says the company's business is exceedingly good in these lines just now, and has been for the past two years all that they expected.

Quotations.

NEW YORK, Monday, Feb. 26, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:	
No. 1 X foundry	$23 70 @ $24 20
No. 2 X foundry	22 70 @ 23 20
No. 2 plain	21 70 @ 22 20
Alabama Irons:	
No. 1 foundry	22 25 @ 22 75
No. 2 foundry	21 25 @ 21 75
No. 3 foundry	20 25 @ 20 75
No. 1 soft	22 25 @ 22 75
No. 2 soft	21 25 @ 21 75
Foundry forge	19 75 @ 20 25

Bar Iron — Base sizes — Refined, mill price on dock, 2.20 @2.30c.; store price, 2.50 @ 2.60c.; common from store, 2.45 @ 2.50c.

Tool Steel—Base sizes—Standard quality, 7 @ 8c.; extra grades, 12 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—Ordinary brands from store, 2.80 @ 3c.

Cold Rolled Steel Shafting—Base sizes—From store, 4 @ 4.20c.

Copper—Lake Superior ingot, 16¼c.; electrolytic, 16 @ 16⅛c.; casting copper, 16c.

Pig Lead—Wholesale lots, 4.70c., New York delivery; carloads, 4.72½ @ 4.75c.

Pig Tin—In 5 and 10-ton lots, f. o. b. New York, 32½c.

Spelter—Prime Western, 4.60 @ 4.70c., New York delivery.

Antimony—Cookson's, 10.95 @ 11.25c.; Hallett's, 9¾c.

Lard Oil—Prime City, present make, 50 @ 53c. in jobbing lots.

Molding a Propeller Wheel in Green Sand.

BY R. H. PALMER.

The following sketches show one way of molding a propeller wheel with four blades from a pattern of one blade in green sand. The wheel is about 6 feet 9 inches in diameter.

The pit for the casting is dug, the spindle seat is sunk in the center of it, and the spindle is plumbed. The finger *B*, Fig. 1, is next fastened on the spindle, and to this finger is bolted strike *a*, which is leveled, and then bed *c* is struck up with it.

Four stakes *F* are then driven at four correctly spaced points. These stakes are just outside of the circle swept by the end of the propeller blade, so that the blade will pass between them and the spindle. You will see that they are set with the angle, and not the side, toward the blade. In setting these stakes I would have the carpenter take two strips of board and fasten them at right angles, the middle of one across that of the other, and have a hole the size of the spindle bored in the center. Cut the pieces then to a length equal to the diameter of the wheel, and mark the ends of the pieces, so as to form the corners of the square. Drop this cross over the spindle, and drive the stakes to match these marks. A mark *c*, Fig. 2, is now made on the pattern of the blade.

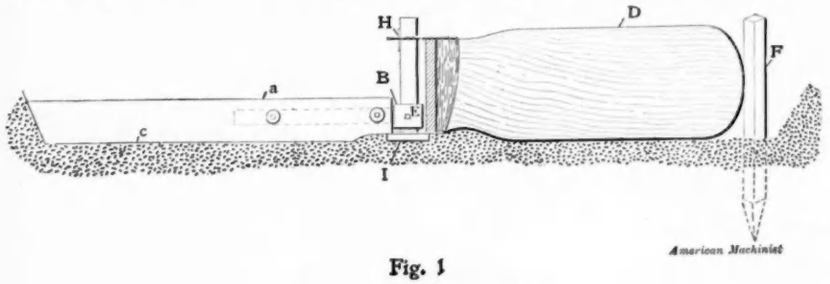


Fig. 1

SWEEPING THE BED.

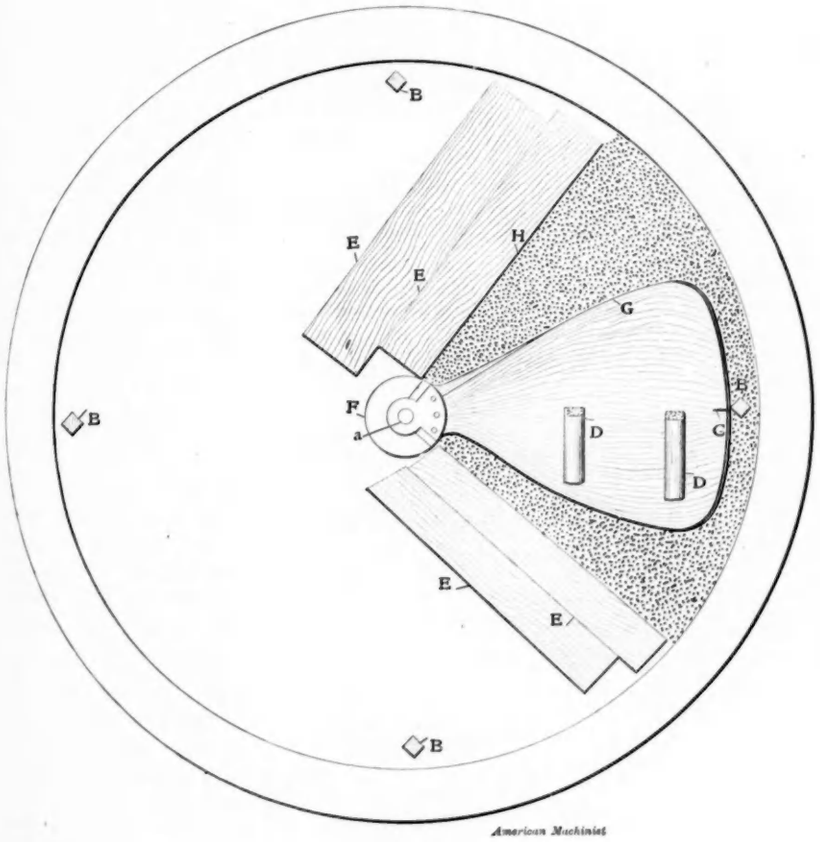


Fig. 2

FIRST BLADE BEDDED IN.

The propeller blade has on it a plate top and bottom, and a hole in each plate the size of the spindle, a loose fit, and in the top plate is squared out a place to drive a wedge, as at *H*, Fig. 1. The strike *A* being removed, the pattern of blade *D* is dropped on the spindle and rests on the core-print for the center core which is also dropped down the spindle and bedded in at I on the bed which has been swept, and the pattern is so placed that mark *C*, Fig. 2, meets the corner of the stake *B*. Weights D are placed on the pattern, also pieces of board are laid on the bed, as *E*. These boards serve to keep the bed in good condition while the first blade is being rammed up. The blade is now tucked under and rammed up, and we have Fig. 2 as a whole, and then the joint is made, which slants from the top of the blade *G* down to what is to be the bottom of the next blade, say at *H*, as near as we can guess.

The wedge at *H*, Fig. 1, is now loosened and the blade pattern is rapped and raised and swung around so that the mark *C* on the blade pattern will come to the corner of the next post, and this quarter is rammed up. This is continued until we have the four blades rammed up in the pit, which gives us Fig. 3, the parting being made as we go along, and the stakes drawn as each quarter is rammed up. The last time the blade is rammed up it is left in the sand.

The cope is next placed in position, and rapped down to a solid bearing, and the stakes at the four corners, as *a*, Fig. 5, are driven. The bars are fitted as near as can be got at, but it will be seen that there is a deep pocket of sand to carry to each blade. Bars are now pushed down between the bars that run across the cope, to as near the pattern as wished. These bars are known to the molders as chucks, and this operation would be termed "chucking the flask." These chucks are nailed in solid, and that quarter of the flask is rammed up. It is almost impossible to get all the chucks in to fit all of the four blades, as there is but one blade pattern in the sand and the rest are the drag-side impressions. It calls for a great deal of guesswork to bar those quarters and yet leave room for the thickness of the pattern; a part of it can be done, yet much cannot.

The quarter of the cope over the pattern is now rammed up, gate-sticks are set for riser *B*, Fig. 5, and also to carry off the vent, also the pouring gate for this quarter, as *C*, Fig. 5. Pig iron is placed on the opposite quarters of the cope to balance it, and the cope is hoisted off. Along near the upper side of the blade a channelway is cut in the joint running to the gate-stick which was set to carry off the vent, and vents are run under the blade. The pattern is now drawn, and set back in the next drag impression. The cope is lowered on, any uncompleted chucking is done, the gate-sticks are set, and that quarter is rammed up; and so on for the remaining quarters. Care must be taken to ram solid and to secure well, as the chucking of quarters not rammed gives those that are quite a jar. Finally, the cope is lifted off after the last quarter is rammed, and it looks about like Fig. 4.

The mold is now finished and blacked, although on the extreme ends of the blades I would leave the blacking off, as

that part is so thin that it might cause cold-shuts, and I would rather put in a little extra work in cleaning the casting. The core is now set. The cope is tried on after finishing. Ramming up the center bar is done by someone holding a piece of something underneath while someone else above rams in. The cope being tried on and found correct, is lowered on for

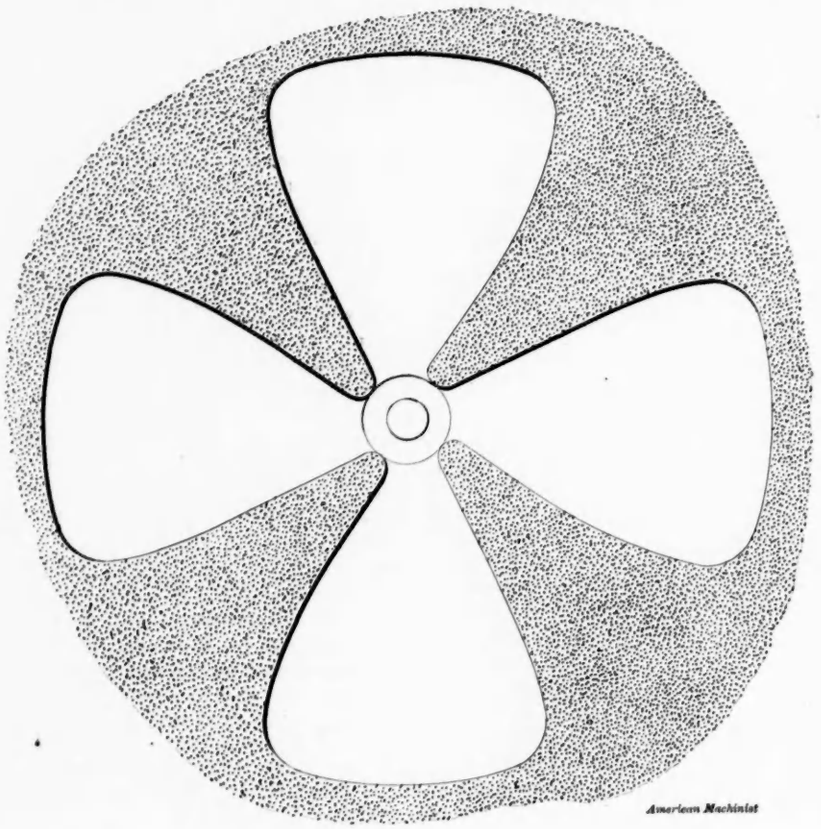


Fig. 3

THE FOUR-BLADE IMPRESSION IN THE DRAG.

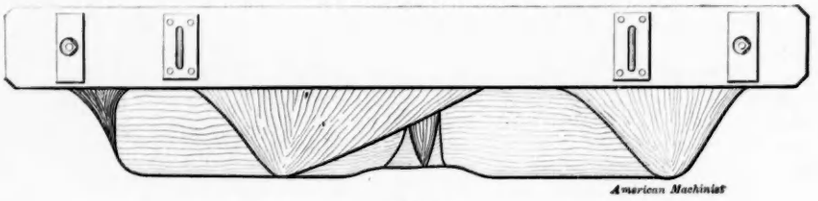


Fig. 4

THE COPE.

good. Runner box *D*, Fig. 5, is placed in position, and runner *E* is built. Binders *F* are placed lengthways, resting on pieces of board laid on the edge of the cope, as *a* Fig. 6, and cross pieces are laid from binder to binder, as *G*. Blocking also is placed under the ends of the binders, as *H*, Fig. 5, and wedged, as *I*. Weights are now placed on these cross-pieces, as *H*, Fig. 6, and *J*, Fig. 5; wedges, as *K*, are placed between the binders, and the bars, run-offs, as *L*, are built from the risers, and pieces of pig iron are laid across the runner-box over the center. Balls of clay are placed in the tops of the risers and lightly weighted, so that they will not blow out. Block well under the ends of the binders and weight well. In pouring, the iron must be in good shape, and sent in lively. Cut quick when you cut; but remember that there is more of a strain, or more lift, on a wheel cope of this kind than is usually thought.

In molding a four-bladed wheel, if the wings are narrow, a smaller cope may be used by bringing the blades in the corners.

White Metal or Gunmetal for Bearings.

BY W. H. BOOTH.

An experienced American engineer once remarked to me that the use of gunmetal in America had not been the success which it has always proved in England. It was not, he said, that its quality was bad, but there was some bar to its success which did not, apparently, exist in England. Of late years, however, in England I have noted a growing use of soft or white metals, and when the facts come before one it becomes necessary to seek the real causes at work. In trying to find such cause or causes it has occurred to me that twenty-five or thirty years ago there was comparatively little engineering carried on in America, whereas here it was an old-established industry. It is thus within the past thirty years that machine construction in America has grown up and found what may be described as the line of least resistance. Assuming, as we may very properly do, that the lines of least resistance in mechanical work are determined by experience and the general average of the results of trial, we find that one line has been found in the avoidance of gunmetal and the adoption of white metal, and it has occurred to me that the period of development of American work has curiously coincided with another fact in engineering.

I have been casting back my thoughts to early days, and remember that in the stores of my father's factory there were two large tin cylinders of oil. One of them contained oil for common purposes, and the other sperm oil. I remember how this oil had become very scarce. We paid from $2 to $2.50 per English gallon for it (*i. e.*, 8s. to 10s.). Light lubricating oils to-day may cost about 16 cents per gallon. Naturally, the oil question was then one of considerable importance. It cannot be denied that sperm oil was a first-class lubricant. Chemically speaking, sperm oil is a fluid wax. It is of low viscosity at 60 degrees F., and yet maintains its viscosity well as temperature rises—a fact held by some to account for its excellence as a general lubricant. Its specific gravity is about .875 to .884, whereas whale oil has a specific gravity of .921, and all other vegetable and animal oils are heavier than sperm oil. This fact made it impossible to adulterate sperm oil with other organic oils. But certain of the mineral oils of Russian and American origin are of even less specific gravity than sperm oil, and could not, if mixed, be detected by the method of the hydrometer. Mineral oils only came into use about thirty years ago, or less, in this country. We may assume that in America mineral oils were pretty firmly established before the growth of mechanical engineering had fairly commenced. Now I am coming to the fact that I wish to emphasize, namely, that English machinery work has grown up and been firmly established on organic oils, whereas American industry has been fostered on mineral oil. Both countries now use mineral oil to the large exclusion of the organic oils, though, excepting in steam cylinders, it is open to doubt if mineral oils alone are altogether desirable. With expensive sperm oil it was an object to find a substitute. In the general work of cotton mills I found that by mixing sperm oil with half its bulk of mineral oil, at half the price, a saving of

about 7 per cent. at least was effected in the total driving power. Thus, by reducing the cost of oil one-fourth the fuel bill was reduced. Sperm oil, like other organic oils, will oxidize or gum, though to a less extent than most oils. The mixing with mineral oils protects the organic oil from the influence of air, and this possibly accounts for the improvement noted. It is now well recognized that mineral oils have

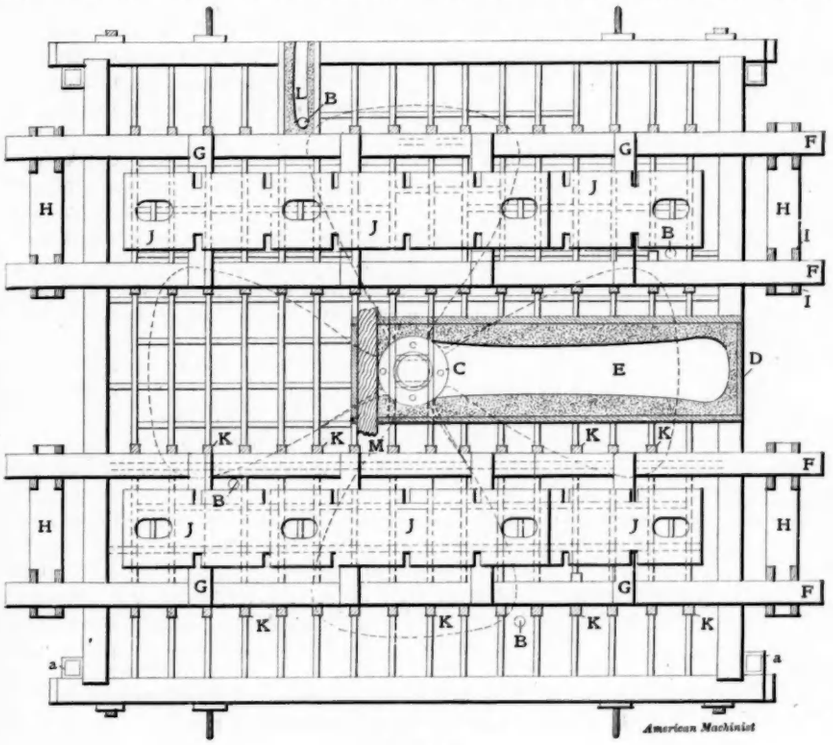


Fig. 5

TOP OF MOLD COMPLETE.

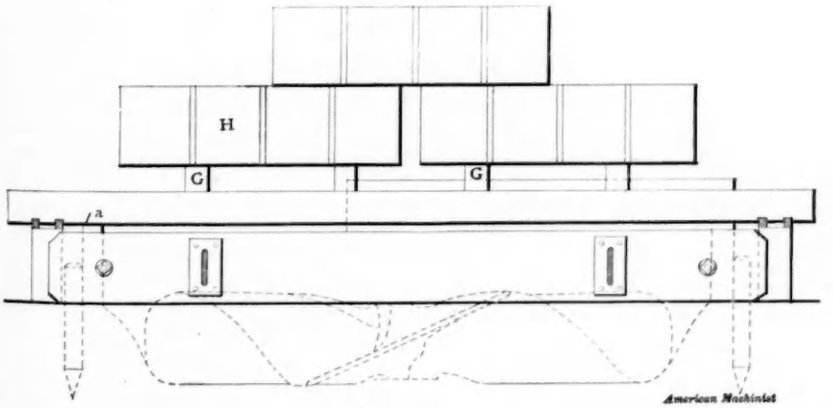


Fig. 6

SIDE VIEW OF MOLD.

this property. But mineral oils fail in respect to that property of greasiness which can best be explained by rubbing a sample of oil between finger and thumb. This deficiency in mineral oils has prevented their use pure with gunmetal or bronze bearings, and in England it has been customary to use blended oils, though, as a fact of long standing, pure mineral oils have been used in America, but with white metals. It seems probable and likely that the plentiful supply of mineral oils has thus practically led to the so universal employment of white metal in America, and is rapidly doing the same here.

Few realize how very serious is the loss of power from unsuitable lubrication. Were this better realized there would be more experiments made with a view to determine the really cheapest oil. This is determined quite as much in the coal heap as in the oil bill. Pure mineral oils are said by one authority only to be suitable for pressures below 70 pounds per square inch. It may be that the heavier pressures allowed here than in America are more or less a part of the same chain of circumstances.

We are all apt to criticise unfavorably proportions in machinery which do not fall in with our own ideas and experience. I fear we often do this without sufficient thought to the difference of conditions. If we cannot see such difference it is just as well to think it out.

London.

[Our readers will bear in mind that gunmetal is the term commonly used in England for what is here usually called bronze, and that the English term white metal includes about the same class of alloys as does babbitt with us.—Ed.]

The Progress of the Mechanical Arts in Three-Quarters of a Century—II.

BY COLEMAN SELLERS.

It has been the scientific methods introduced by the managers of the railroads, aided by the skill and perfect equipment in their workshops, that have made those great railway systems what they now are. They must exercise the utmost caution in all that they undertake; every alteration or deviation from adopted standards involves so many pieces that must be changed. In regard to the simple matter of making brakeshoes for the cars and boxes for axle journals, I know from my own experience that it was not until the introduction of machines for molding these pieces accurately that the best results could be obtained and the parts made exact and perfectly interchangeable. Every invention, whether it be in the foundry or in the machine shop, is cumulative, and has its effect upon other trades, and through our ingenuity and progress we have now reached a point when the whole world looks to America for certain work, which it seems cannot be done to equal advantage in other countries.

Dr. John Anderson, then in charge of the Woolwich Arsenal, England, was sent to this country to visit the Centennial Exhibition in 1876, and besides acting as one of the judges of the machine tool exhibit, he made an official report as British Commissioner to both houses of Parliament. Prominent in these reports there will be found one on "Machines and Tools for Working Metal, Wood and Stone at the Philadelphia Exhibition," in which the following statement occurs:

"Great Britain certainly can claim the credit of having been the birthplace of modern machine tools, and has done wonders in raising the mechanical standard of perfection, and her influence for good in the advance of civilization thereby is incalculable; but when we consider the enormously greater area of the American continent, it is a matter of vast importance that tools have taken such a hold of the American mind, which will influence the civilization of the Western world for ages to come, and will exercise a powerful effect, not only on that continent, but on Australia, China and the world generally." This, therefore, has a profound

significance which can scarcely be overrated. Again he said: "The display of machine tools made by the United States was so vast that only the more salient points can be noticed in a brief report. It showed certainly that the past century has not been passed in idleness, and, judging by the enormous stride made by them during the past few years, it showed that they have been intelligent students of the best European authorities. It is true to say, however, that the Americans, as a rule, are not copyists; the inventing of clever devices and tools for saving labor seems to be their natural forte, and worthy of the old stock, probably quickened by the peculiarly favorable circumstances under which they live. It was the display made in this section which most conspicuously brought out the enormous strength of America as a producing power. More than a hundred exhibitors had each a large exhibit that commanded the admiration of all who took the trouble to examine them in detail. In this vast array were machines for all purposes, small arms, ammunition, sewing machines, clocks, watches, and all the branches of machine making and engineering, and almost all were finished in a style superior to that of any former exhibition."

In the engineering practice of the first quarter of this century, scientific methods did not obtain. There was little technical literature to help the designer, and the best results which have made American ingenuity appreciated the world over were brought about through careful experiments and earnest effort on original lines. The history of the steam engine, so far as the American types are concerned, was clearly not the outcome of the books, for what is thus taught under the head of thermo-dynamics is really a description of what had been accomplished, rather than the cause of the development. The need of technical education was early felt, but the want was not supplied until the generosity of individuals rendered the foundation of technical schools possible. The government cannot be looked upon to aid in such institutions in the United States as it can in England, yet up to 1884 in London there was no technical school in existence that in any way compared with those at Hoboken and Boston in this country, besides which engineering is now taught in our universities. At a dinner given to the members of the Institution of Civil Engineers, in 1884, Sir Lyon Playfair, in responding to the toast of "The Universities of Scotland," after those of England had already been discussed by able speakers, astonished his audience by refusing to speak to the toast directly, and entered a strong plea for technical education in England such as existed at that time in the United States. He said they should not look to Germany and France for the examples of technical schools, but across the Atlantic, where those speaking their own language had already put in practice what England had so long needed. While the speaker was doubtless correct as to the wants at that time in Great Britain, the technical school of South Kensington was then being organized, and the guilds of London had contributed freely toward its support. Good work had been done by this and other schools, and by the trade schools that have been established in various parts of England.

We are long past the period of empirical work. The steel makers and iron founders now depend upon metallurgists to guide them, while every well-equipped machine shop in the country must have its staff of educated men, who are able to reinforce the practical knowledge of those engaged in manufacturing by exact mathematical methods that in the early stages of our profession were limited to simple arithmetic.

As indicative of the necessity of education on the part of the working classes, I have known instances in which labor-saving machinery that was cheapening the output in a particular class of hardware when introduced in America, in England failed entirely and brought discredit to the member of the firm who had advised its purchase. A gentleman interested called upon me afterwards and solicited letters enabling him to visit some of the industrial establishments in the United States. Upon his return from these places he told me that all that had been said about the character of the work done by the machinery in question, not only had been confirmed, but that its merits had been underestimated. He said, however, that in his opinion, it was impossible to utilize it to advantage with the workmen in England, owing to trade prejudice and trades union regulations. What the peculiar conditions were I am unable to say, but what I wish particularly to impress upon my hearers in this respect is that in his opinion the difference in the character of our workmen and workmen of the same trades in England is wholly due to the better education of the Americans, who are fully two generations ahead of those abroad.

It is perfectly evident that it is impossible to raise the standard of work by means of labor-saving machinery unless the workingmen themselves will see the advantage derived from their ability to do more and better work, and thereby obtain better wages. This is particularly the case when they are called upon in this country to operate machines that do not require constant attention, but where it is possible for one man to attend several machines and earn higher wages than he possibly could if compelled to stand idly watching a machine that required but a small portion of his time to operate. There would be no inducement to contrive automatic machinery unless those who use such machinery are able without prejudice to take advantage of the saving in labor attainable thereby.

Shipbuilding all over the world, since the first iron vessels were launched, shows by the constantly improved output the wonderful progress in scientific knowledge, and in manual as well as technical skill. The great fighting machines for the ocean have been improved with astonishing rapidity. This year our own output in that line has for the first time been tested and found good, when handled by men of whom we as a nation may feel proud. The nations have been increasing the power of their fighting ships year by year, adding new improvements in machinery, new means of resisting attack from other ships, new guns and newer projectiles to pierce the new armor plate, and let us hope with decreasing opportunity to bring the results to actual test in battle. In our own recent experience, practice at great cost found our trained marine force better equipped for the operation of these fighting machines, and in the far East and in the West Indies our guns swept a maritime power out of existence with upon our part scarce the loss of a man.

In working iron and steel the introduction of the Whitworth forging press marked an important advance compared with the costly steam hammers, and hydraulic presses became absolutely essential in perfecting the American type of link and pin bridge construction. Some of the forgings required for the 5,000 horse-power dynamos needed by the Niagara Falls Power Company could not have been executed by means of any existing steam hammer in this country or elsewhere, and the Bethlehem Steel Company were the first to introduce this system of forging on a large scale. Forging by pressure in place of impact by hammers enables the force required to cause a given deformation of metal to be accomplished with the least expenditure of power and greater exactness, as was soon manifested in the readiness with which hollow shafts were produced. About 1893, the work at Niagara Falls called for steel rings of absolutely uniform density, having an outside diameter of 11 feet 4 inches, with a width on the face of approximately 50 inches, and a thickness of over 5 inches, which necessitated the use of a press of greater capacity than any heretofore erected. The press at Bethlehem, combined with the Whitworth system of compressed steel ingots, was taxed to its utmost to make what was needed in this case. It is interesting to note that this work was the first product of machinery introduced mainly to furnish armor plates and the massive steel forgings needed for our modern ships of war.

The plant of the Niagara Falls Power Company offers evidence enough of the remarkable progress that has been made, not only in the mechanic arts, but in the high scientific ability required to design

machines that had no precedent in size or in exact requirements as expressed in the specifications predetermining each requirement as to the results to be accomplished. Thus the designers of the dynamos were called upon to guarantee an output from each unit of power with so high an efficiency that all the magnetic and electric losses in the machine would not amount to over 2½ per cent. This requirement was fulfilled, and when subsequent machines were installed the result was even more favorable than in the first instance. The final result is the crucial test of all progress, and certainly we have in those of our industries which require mechanical skill sufficient evidence of the marvellous progress that has been achieved during the past seventy-five years.

As I have taken occasion to mention the work at Niagara Falls, which has engaged so much of my attention, it may interest those who are not familiar with the results of this undertaking to hear something further in regard to it. At Niagara Falls we had for the first time to construct a tunnel that would be adapted as a tail race to the development of 100,000 horse-power. The International Niagara Commission had decided that 5,000 horse-power was to be the unit, and the plant was accordingly laid out on this basis. It was assumed that water-wheels could be made of that capacity and could be placed 150 feet below the level of the dynamos to be operated, where, as one of the Commissioners suggested, the length of shaft would be about the same as between the propeller and engines of an ocean steamship. In the practical solution of this problem we were obliged to have similar thrust bearings to guide the shaft, but the construction of the turbines is such that the water under the upper wheel of the two in the case is made to support the whole mass of about 160,000 pounds. The dynamo at the upper end of the shaft, therefore, practically spins on a cushion of water with only a pressure of 3,000 pounds, more or less, on the thrust bearing rings, according to the vibrations in the velocity as the power developed is increased or decreased.

It is too large a subject to permit me to refer in detail to all of the work that had to be done at Niagara Falls, but I want to say that while our constant effort has been to interest the manufacturers of machinery to make designs that they could guarantee, a great deal of designing has been necessary by the engineers of the company, most of which was experimental, and that no failures should have been experienced is most satisfactory, when I realize how little precedent we had to guide us and the risk attending the solution of the problem as it was presented to me.

The first three turbines that were installed in accordance with the design of the builders had to be materially altered, and I have introduced improvements of my own invention to enhance their efficiency as far as the shaft transmission is concerned. These modifications were made in the five units that were subsequently installed, and, without any change in the water-wheels, the efficiency was increased so that they delivered 5,500 electrical horse-power each, instead of 5,300 horse-power, which was the output before the changes were made.

As now constructed, all the electrical and magnetic losses in each of these dynamos aggregate but 2½ per cent., and you can judge what the efficiency of the water-wheels must be when those which at 75 per cent. efficiency would give 5,300 horse-power, are now driving dynamos that deliver 5,500 horse-power without any changes in the wheel, but only such alterations in seemingly immaterial parts as the design of the connection between the water-wheels and the dynamos.

As regards the utilization of the power being developed at Niagara Falls, it may interest you to note that we hope shortly to have ten dynamos running, each of 5,000 horse-power nominal capacity, but actually capable of delivering over 5,000 horse-power each.

The first industry established in connection with the plant was a paper company, which required 7,200 horse-power, but it installed its own wheels on land of the Power Company, and utilized the latter's tunnel and canal facilities. Next followed the Pittsburg Reduction Company, which takes 8,550 electrical horse-power for the manufacture of aluminum. The Carborundum Company, for making abrasives, takes 1,030 electrical horse-power. The Union Carbide Company, 5,000 electrical horse-power, for the manufacture of carbide of calcium. The Niagara Electro-Chemical Company, making peroxide of sodium, that is, metallic sodium, takes 400 electrical horse-power. These and other works now in operation or being installed will utilize, possibly by the first of next year, a total of 41,000 horse-power. Most of these establishments are electro-chemical or metallurgical in their processes, and have sprung into existence with the development of hydro-electric power, although they are based upon principles which were discovered years ago. The metal sodium, for example, is made commercially by practically the same process as was employed by Sir Humphrey Davy when he first began experimenting with the galvanic battery for the reduction of metals. The alternating current that has been adopted in the machines that generate this electricity is the alternating current as studied by Michael Faraday. The change in the potential from 2,200 volts at the machine to 11,000 volts in transmission is effected by the transformers that were discovered by Faraday, and were formerly used chiefly in Ruhmkorff coils and other philosophical instruments. The principle as known then became useful for lighting purposes when the alternating current took its place in the lighting of cities.

In the problem presented at Niagara Falls we had to provide for direct current to operate railroads and for electro-metallurgical purposes. This power is developed and transformed from two-phase into three-phase by an invention of Mr. C. F. Scott, of the Westinghouse Company.

It is a noteworthy fact that since the first wheels were started in 1895 there have been no stoppages of more than an hour or two at the most. The plant has been in operation night and day, carrying on processes that permit of no interruption on account of the loss which would result.

I regret that I cannot discuss this subject at greater length, for the machinery and appliances installed at Niagara Falls, as well as the industries which have resulted from the development, have made the enterprise one of the important achievements of the period we have under consideration.

Reviewing the century's progress, one cannot but be impressed with the tendency to specialize all industries. It has been truly said that jobbing shops are and always will be a necessity, but that manufacturing establishments will lead in the march of improvement. Trades are becoming more diversified, and time, talent and capital are being expended upon individual machines and appliances as special which were formerly but a part of the output of single establishments. To this concentration of the best thought upon special branches of all industries we may attribute much of the progress in the mechanic arts made during the past seventy-five years, which has opened the markets of the world to the products of our industry. The influence of the Franklin Institute has played no small part in this progress, and, as one long identified with its work, I extend my greeting to its members, hoping they will continue to advance the usefulness of an institution which worthily bears the name of one of the greatest philosophers that America, and the world, has produced.

An American Dredge in Russia.

The successful trials of the powerful dredge "Beta," built for the Russian Government by the Société Cockerill, of Seraing, Belgium, from plans drawn by Lindon W. Bates, of Chicago, have attracted the attention of the leading countries of the world. The contract for this boat, made in 1897, demanded a capacity of 1,600 cubic yards an hour, with a premium of half the dredge's cost if it should deliver 2,400 cubic yards an hour, which was beyond anything heretofore attempted. The "Beta's" official trials have recorded a capacity of 7,800 cubic yards per hour.

The first of these hydraulic dredge

boats was built for the United States Government in 1896 for use on the bars in the Mississippi River. It attracted the attention of the Belgian Government, which sent a committee of engineers to America to investigate the Bates system with reference to the availability of the machines for the proposed "Grande Compure" in the Scheldt below Antwerp. The commission reported minutely on the American dredges and advised their adoption for the Scheldt improvement. This report attracted the attention of the Russian authorities, who had been trying to find means to remove obstructions in the Volga for a long series of years. Mr. Bates' report to Prince Hilkoff resulted in a contract to construct for the Russian Government, for the sum of $515,000, the largest and most powerful dredging machine in the world, to be self-propelling by electric power, something unheard of in hydraulic dredging.

So general was the interest in the official trial that, in addition to Prince Hilkoff and four Russian commissioners, there were present the German, French, Austrian and Turkish ambassadors, the Belgian ministers, commissions from Australia, India, Germany, France and the Argentine, and hundreds of engineers from all parts of Europe. Trains were run at reduced rates to accommodate the people eager to see the "American dredge," and the Société Cockerill for six weeks kept boats at Antwerp taking visitors up and down the Scheldt to the points of operation.

The official trials demanded two things: First, that the dredge should on a 2-foot cut, 1,000 feet in length, make an output of 1,500 cubic meters (52,974 cubic feet) per hour; second, that in a three-hours' continuous run in a cut 3½ feet deep it should put out 3,000 cubic meters (105,948 cubic feet) per hour. The three-hour test was to prove the capacity for enduring work. The measurements were made at Antwerp in excavation. The official record states that the tests show an average capacity, "conservatively estimated," of 7,000 cubic yards an hour. This by barge measurement gives about 8,400 cubic yards per hour as the average. The maximum was at the rate of 10,350, both being one-third in excess of the highest official records attained on the Mississippi.

Prof. V. E. Timonoff, Councilor of State and one of the commissioners sent down to accept the dredge, summarizes as follows:

"According to contract, the dredge should excavate 3,000 cubic meters at a thickness of 3½ feet, and 1,500 cubic meters at a thickness of 2 feet. Comparing these figures with the official report, we see that for a stratum of 3½ feet the capacity proved to be 1.46 times more than contracted; for a stratum of 2 feet, 3.77 times more than contracted for."

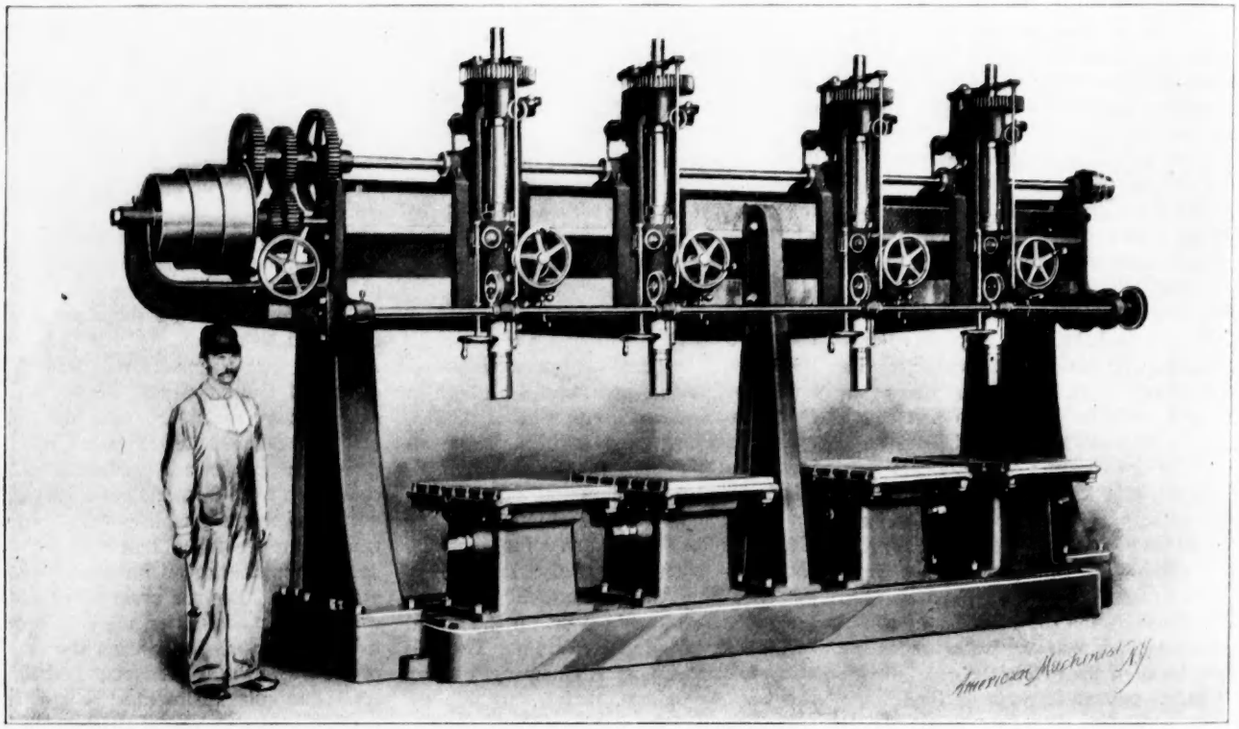
The government of Queensland, Australia, having difficulty with its harbors and a capital city which floods keep inundating, invited Mr. Bates to visit that city last winter. He has reported on all the ports of the colony. His system was adopted, and machinery to the value of $1,250,000 was decided upon, provided the Russian trials should prove the machines capable of fulfilling the contracts.

As the result of the trials of the "Beta," Calcutta has closed an order for one dredge of the same type. Queensland has contracted for three of 10,000 horsepower. Of these, one destined to combat the effects of floods is to be more powerful than the Volga machine. Russia has in contemplation several more, and other negotiations are pending which will carry this valuable invention to many countries of the globe.

W. R. Holloway.
Consul-General.

St. Petersburg, December 8, 1899.

Advance Sheets of Consular Reports.



A NEW FOUR-SPINDLE DRILL.

New Four-Spindle Drill.

The half-tone shows a drill recently built by the Bickford Drill and Tool Company, Cincinnati, Ohio, for the new shops of the Westinghouse Machine Company, East Pittsburgh, Pa. The size and power of the machine may be estimated from the fact that it is capable of drilling simultaneously four 3-inch holes through 12 inches of solid steel with a feed of 1 inch per minute.

The machine is 19 feet 7 inches long by 6 feet 9 inches wide, and weighs 30,000 pounds. The smallest diameter of the drill spindles is 2½ inches, vertical traverse 19¾ inches, and greatest distance between end of spindle and top of base 4 feet 7 inches. The maximum distance between the end spindles, all being movable, is 13 feet 5 inches, and the distance between housings 13 feet 6 inches. The extreme hight of the tops of the spindles

from the floor is 11 feet 3 inches. The cone by which the machine is driven has three steps, and the back gears give three changes of speed in the ratios 1 : 1, 1 : 2, 1 : 4, thus making nine speeds, the back gears being engaged or disengaged by the hand wheel at the right of the cone.

The heads are of new design throughout, differing from the smaller sizes of machines built by this company, in that each derives its feeding power from a fast running shaft, the speed reduction being made in each head instead of at the end of the machine. There are three changes of feed, individual stopping and starting devices and separate adjustment along the rail, making the spindles independent in every particular. There is both hand and power feed, quick advance and return, and an automatic stop with graduations on the sleeve so that it may be readily set to trip at any desired point. The rail, base, tables, number of spindles and other particulars may, of course, be modified to suit the requirements of any class of work within the range of such a machine, this being merely a sample of many possible useful constructions.

A Constantly Adjusted Twist Drill Grinder.

The twist drill grinder which we here illustrate will grind twist drills of any size from ⅛ to 2¼ inches, giving them the correct shape and clearance without any readjustment for either. In case there is any difference of opinion as to what clearance may be preferable, or if some materials or some rates of feed in drilling require a different clearance from others, this grinder may be set for this desired clearance, and it will then hold good for all sizes of drills until another adjustment is made.

The drill to be ground is laid in the V-rest, best seen in Figs. 2 and 3, the end of the drill backing against the stop in the tail-block. This tail-block may be moved along and clamped where required by the round-headed screw below. In the tail-block is a sliding plunger which also may be moved forward or backward and clamped by the round-headed screw above, and in this plunger is the threaded stem of the stop-piece, a milled nut upon it setting in a slot in the plunger. When the drill is being ground, the final minute longitudinal adjustments of the drill as it is ground away are made by this nut. Near the front end of the "V" is a little thumb-lever by which that end of the drill is raised out of the "V" when required, so that it may be grasped by the thumb and finger to lift it out. At the extreme front of the V-piece is a lip-rest *d*, Fig. 4, against which the lip of the drill to be ground is rolled, thus bringing it and holding it in correct position. In Fig. 3, looking toward the grinding wheel at the V-shaped drill-holder, it will be seen that the left side of the end of it is parallel with the face of the wheel, and nearly close to it, while the right side is curved away to clear the wheel as the drill-holder is swung around in the act of grinding.

In Fig. 2 is seen the fixed stud *A*, projecting from the front of the frame and parallel with the wheel mandrel. On this stud is the split sleeve *C* with a screw to clamp it, and an arm extending backward with a bearing pointing obliquely upward and forward in which swings the bracket which carries the tool-holder. The grinding of the drill is done by the swinging of the drill-holder in this inclined bearing. The apex of the V-shaped groove in the drill-holder is in line with the inclined axis of the journal, so that when the drill-holder swings from side to side, it turns on this point as on a pivot. The face of the grinding wheel being at an oblique angle to the axis of the journal supporting the holder, any parts supported in the drill-holder will be ground to correspond to a portion of the surface of a cone, and consequently a small drill laid in the "V" will come nearer the apex of the cone, and will be ground to conform to that portion of the cone, while a larger will not set so deep in the "V" and will be ground to correspond to a cone with a larger base, and the size of the drill placed in the holder automatically determines and secures the correct curvature. The lip-rest is capable of adjustment at such an angle that the front edge of the cutting lip of the drill at its periphery will be in advance of the cutting edge near the center, and this peripheral portion, as it comes in contact with the grinding wheel, will be ground at a lesser angle of clearance than the portion near the center. The rocking motion given to the holder when oscillated causes the center portion of the drill to remain longer in contact with the grinding surface of the wheel than any portion of the same size along the periphery of the drill, which action also will tend to in-

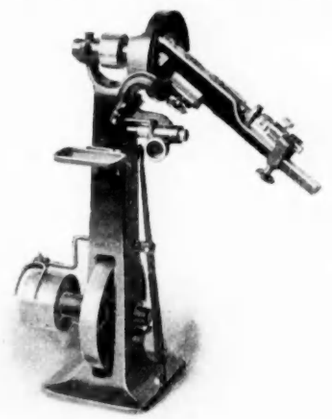


FIG. 1. A CONSTANTLY ADJUSTED TWIST DRILL GRINDER.

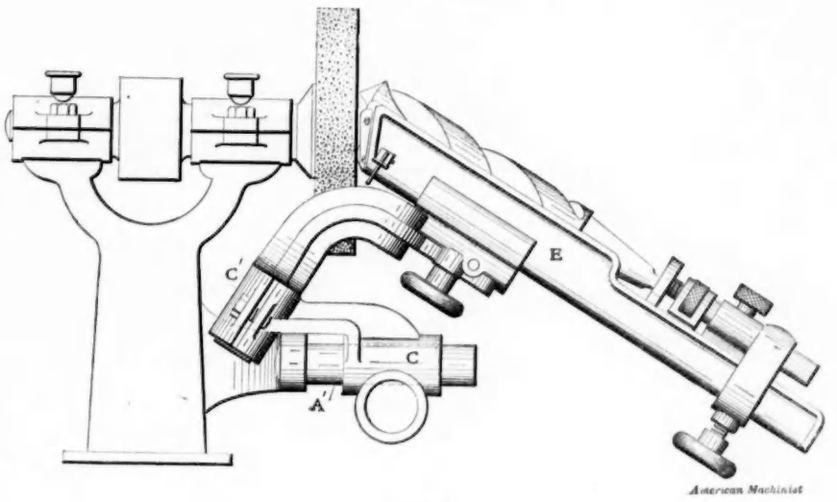


Fig. 2

SIDE ELEVATION OF TWIST DRILL GRINDER.

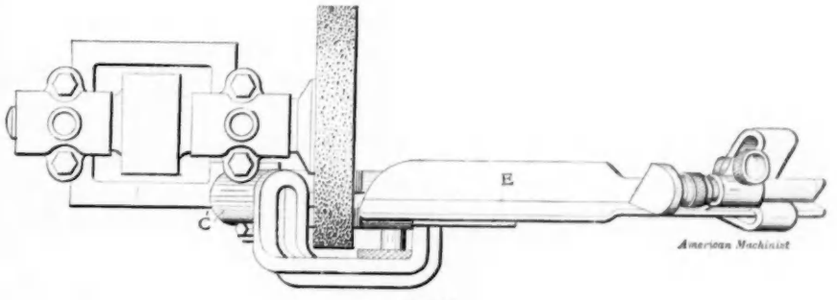


Fig. 3

PLAN OF DRILL GRINDER.

crease the angle of clearance at the center of the drill. This effect upon the drill is caused by the peculiar relation which the axial line of the angle of oscillation and the angle of the longitudinal line of the holder bear to each other.

The under side of the drill-holder *E* is rounded to fit a corresponding surface on the bracket which supports it, and it is made to turn a certain distance upon this cylindrical surface by means of a worm, as shown in section in Fig. 5, and it may be clamped in any position, as shown in another section at Fig. 6. This adjustment of the tool-holder changes the clearance that may be given to the lips of the drill, and a pointer and graduated arc are provided to indicate the precise adjustment. As the face of the wheel wears away the entire holder and bracket may be moved by sliding the sleeve *C* on stud *A*, or it may be rolled to carry the drill lips inward or outward relatively to the center of the wheel.

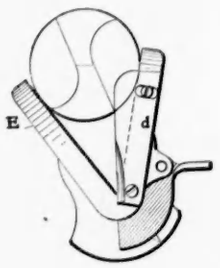


Fig. 4

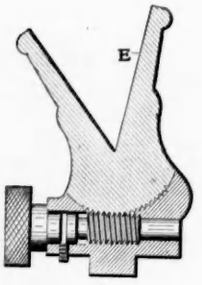


Fig. 5

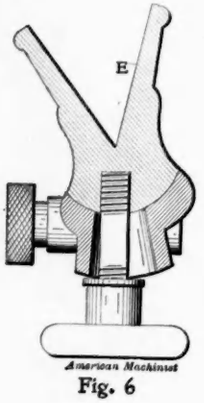


Fig. 6

DETAILS OF TWIST-DRILL HOLDER.

This machine is made by the Fuller Manufacturing Company, Kalamazoo, Mich.

Legal Notes—An Accident in Oiling Machinery in Motion.

An interesting case recently appeared before the Appellate Division of New York in the second department, in which Joseph J. Spencer figured as the plaintiff and Henry R. Worthington as defendant. Spencer had been in the employ of Worthington for about nine years, engaged in the operating of tools and machines used to cut metal in the shops where pumps and hydraulic machinery were made. In the course of Spencer's employment it became necessary for him to oil a tool held by a ram which was moved upwards and downwards with great frequency. The spout of the oil can used for this purpose was caught by the ram and bent over upon Spencer's finger, injuring it so that amputation was necessary. Spencer sued Worthington to recover damages for the injuries received by reason of the defendant's negligence. The only negligence complained of was that the oil can should have had a long spout instead of a short one. The trial court rendered judgment for $1,115 in favor of the plaintiff, and the defendant appealed. The plaintiff testified that until about three weeks before the accident he had always used a can with a long spout, so as to avoid the danger of his hand being caught in any of the machines; that this can had been borrowed by another workman and not returned; and that although he complained to the foreman and asked to be supplied with a long spout can, he had been obliged to use one with a short spout; and further, that all the workmen in the shop except himself used the short spout cans. There was no evidence that the long spout can was adopted by and used in similar establishments, and the testimony that every workman in the defendant's shop, except the plaintiff, used the short spout can was not contradicted. The Appellate Division therefore reversed the judgment of the trial court and ordered a new trial. In the decision Mr. Justice Cullen said: "The master was not bound to furnish the best-known appliances, but only such as were reasonably safe and suitable for the work. It is true that in many cases the fact that an employee knows of the defective character of the appliances furnished by the master will not preclude the former from recovering for injuries occasioned by such defects. In the use of complicated machinery it may well be that a workman is entirely aware that there is something defective or out of repair, and yet is ignorant of the danger or its extent to which he is subjected by such defect or want of repair. He has the right to rely on the assumption that the master will fulfill his legal obligations to him; that is, use reasonable care to guard him from the dangers of unsafe or defective appliances. Concededly, in this case the character of the appliance and the danger from its use were obvious to the plaintiff. It therefore does not fall within that class where the servant is entitled to rely on the superior knowledge of his master." (44 App. Div., 496.)

Some Large Bliss Presses.

The E. W. Bliss Company, of Brooklyn, N. Y., are busy at present on a number of new machines. Two of the new machines are described as the largest presses of their type which have ever been built, both being double-crank presses, but of different design. One is built in sections, has 8 feet distance between the uprights and weighs over 60,000 pounds. The other has a solid frame casting, which in itself weighs over 31,000 pounds. The latter press is to be double-geared, with a ratio of 1 to 40, and when completed will also weigh over 60,000 pounds. In addition to these machines the Bliss Company are building another double-crank press of the same general type as the first one mentioned, which weighs over 40,000 pounds, and they have in the course of construction in their erecting shop a large straight-sided double-geared press weighing about 28,000 pounds; three toggle drawing presses weighing over 28,000 pounds; a large multiple punch, the casting of which alone weighs over 30,000 pounds; one 11-foot squaring shear; one large open-gap drop hammer, besides a large number of smaller presses of various types.

Exhibitors at Paris.

Ferdinand W. Peck, Commissioner General of the United States to the Paris Exposition, sailed February 21 on the American Line steamer "St. Louis." Previous to sailing he is reported as follows:

"The work here is practically finished. Our eighteen months of labor have resulted in offers of exhibits out of all proportion to the space at our disposal, although we have succeeded in having the original allotment increased more than threefold. As a result of the careful selection necessitated, our exhibits are of an exceedingly high standard and will bear more than a favorable comparison with those of European competitors. We are erecting seven buildings, which are in the nature of annexes to the exhibit buildings erected by the French. We shall have about 7,500 exhibitors, which is ten times as many as we had in Vienna in 1873, six times as many as we had in Paris in 1878, five times as many as at the Paris Exposition of 1889, and three times as many as France had at Chicago in 1893."

In our description of the new bench lathe made by the Cataract Tool & Optical Company, of Buffalo, N. Y., a mistake was made in the name of the company, which was called the "Cataract Tool & *Bicycle* Company," instead of Optical Company. The company call our attention to the mistake, and seem to be decidedly averse to being classed among the bicycle manufacturers.

It is out intention to publish a full account of what is new in machinery shown at the Paris Exposition.

Handles, Ball-Cranks and Hand Wheels.

BY H. DRESES.

When a person, before he settles down, forms the acquaintance of a dozen or more machine shops of all denominations and characters, not merely by walking into the office and saying, "Howd'y do? My name is Rubberneck, and I'd like to see your works," but by going on the pay roll, he will notice the chaotic styles and forms of handles, ball-cranks and hand-wheels. Even in one and the same concern, you often find, like all shapes of legs, cabinets, fillets and roundings, every imaginable form of these three simple machine parts. This is due either to the lack of consistency or training of the head of the concern or to changes of the leading men. While many concerns do need new blood badly, many get it too often—of the kind where the new superintendent or mechanical engineer makes his *debut* by devising a new time card, changing straight lines back into O. G.'s, making rounded corners square and putting in his "new" idea of handles, ball-cranks and hand-wheels, and then walking up to the president or proprietor and saying, "Mr. Schemer, I have redesigned these machines."

The handle itself is a very plain machine part, and it may look almost ridiculous to write about it. But still it ought to fill the requirements of being easy in your hand; it ought to look well, and all that are made in one shop should be of the same style. It can be comfortable only when the ball part of it rests in the hollow of the hand and all the fingers take hold of it, as is indicated in Fig. 1. It is a bad practice to cut off the pointed end, as shown in the dotted line, which takes away the resting place for the little finger. This will be noticed at once by taking hold of a good many of the drop-forged handles now in use and then the style used by the Brown & Sharpe Manufacturing Company. The latter are undoubtedly the most convenient handles in use, though their looks may not be exactly pleasing.

C. John Ramus makes a handle such as is shown in Fig. 2, and the poor fellow who has to use it wishes John could be compelled to monopolize the handling of them. If L, Fig. 1, denotes the length of the handle, good proportions will be obtained by making $d = .38L$, $r = .15d$, $r' = 1.5d$ and $r'' = 1.5d + 1$ inch, and all the other dimensions as indicated on the drawing.

Ball-cranks should, besides having a good appearance, be so proportioned that they as nearly as possible balance from the center hole when the handle is driven into the small ball. As they very often go into places where parts of the machine have to be cleared, it is best to make both ends, measured from the center to the outside of the balls, of equal length. If L is again the length, Fig. 3, $d = .175L + .5$ inch, and $d' = .1L + .5$ inch will give a good appearance and about balance the proportionate handle. The sizes for the shank are indicated on the drawing. These proportions are for drop forgings or cranks made from the bar. While cast-iron cranks never break through usage, many are broken in transit and by accident, and for that reason alone they should be made of steel. Besides, with proper forming tools, they can be produced cheaper than cast-iron ones, and add by their lightness a good deal to the pleasing appearance of the machine.

It is understood that hand-wheels very often have to be designed to suit the conditions, and therefore general rules cannot be very well applied. The dimensions given in Fig. 4, and making $d = .1D + .3$ inch and $r = .2D - \frac{1}{8}$ inch, where D is the diameter of the wheel, give a good shape, in the range from 4½ to 12 inches diameter. Of late, the flat or clearance on the inside of the rim, to save hand work in finishing, is carried to a semicircle. This is very uncomfortable for the hand and looks too much like skimping. Bent arms are often preferable over straight ones and save the knuckles and skin in case a nut or friction knob is applied in the center.

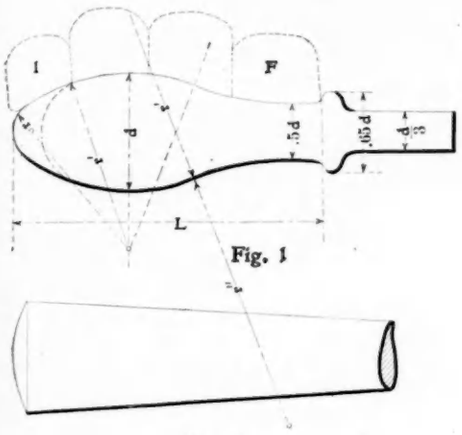


Fig. 1

Fig. 2

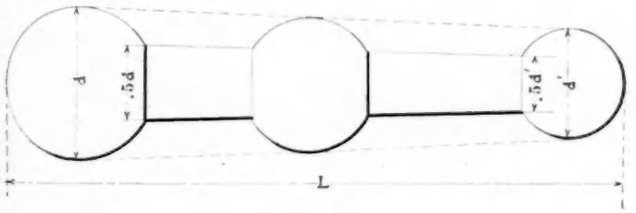


Fig. 3

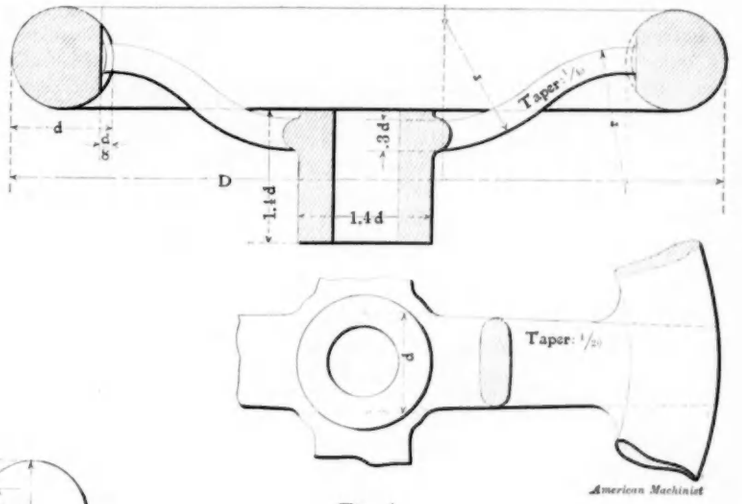


Fig. 4

PROPORTIONS FOR HANDLES AND HAND-WHEELS.

All the dimensions obtained by these formulas rounded off to the nearest sixteenth will answer.

These rules are the result of experience and comparison. They are used in our shops, and only upon request of the editor, to whom they were shown, are published.

Cincinnati.

Machinery for the Philadelphia Mint.

The appropriation asked of Congress for the Philadelphia Mint provides for the purchase of the following: Four 150 horse-power boilers, $17,500; four direct-connected engines and dynamos, $35,000; switchboards, $5,000; filtering machines, $10,000; pneumatic hoists, $2,000; pneu-

matic tools, $1,000; telephones in building, $500; blacksmith's shop, $1,000; transferring machinery to new mint, $5,000; grinding machine, $1,800; 16-inch lathe, $1,000; chucking lathe, $1,500; slotter, $1,000; trucks, tubs, vats, etc., $4,000; gas plant, $16,000; coal-handling machinery and subcellar for storage of coal, $3,000; wiring for motors, $10,000; distribution boards, $4,000; circuit breaker and switches, $3,500; universal milling machine, $1,800; woodworking machinery, $5,000; tools for carpenter shop, $500; motors for carpenter shop, $4,000.

The coining department calls for $79,000, distributed as follows: In the rolling room, 16 rolling mills, at $2,500, $40,000; 16 pairs duplicate rolls, at $200, $3,200; 16 cutting presses, at $700, $11,200; 14 45 horse-power motors (breakdown), at $1,000, $14,000; 16 5 horse-power motors (cutting), at $200, $3,200; 6 25 horse-power motors (finishing), at $700, $4,200; 1 5 horse-power motor (hydraulic), at $200, $200; 1 300-ton hydraulic press, $3,000. The coining room requires $108,600, as follows: 20 coining presses, at $4,500, $90,000; 15 milling machines, $8,000; 30 5 horse-power motors (presses), at $200, $6,000; 15 5 horse-power motors (milling), at $200, $3,000; 2 scales, at $800, $1,600.

The melting and refining room needs $35,800, most of it in small items; the assaying department $6,150, the engraving department $6,535. The annealing room is allowed $20,000, and $50,000 is estimated for incidentals.

The machinery and appurtenances required are not all intended for the actual work of coinage. A large part is required for the building of other coining machinery, and in the course of a few years the Philadelphia Mint may possibly be relied upon for the production of most of the machinery and appliances for all the United States Mints.

Locating Tools in a Reconstructed Shop.

In connection with the subject of transforming an old shop into a new one (published in issue of December 21), in this article a description will be given of the location of tools and the appliances for handling and machining the various parts of engines, giving the course of each piece from the foundry to the erecting floor.

Fig. 1 is the ground floor plan of the machine shop, showing, also, the location of the foundry and a small part of the boiler shop. *A* represents the engine, dynamo and air-compressor room; *D D* lines of track to foundry; *B*, the division wall between the boiler and machine shops.

This wall, having an opening 10 feet wide in order to allow the boilers and material to be brought through, is carried up as high as the passing of the electric crane will permit. This crane spans the space from column to column and traverses the entire length of both machine and boiler shops. The erecting floor occupies the space, within the dotted line, from column 25 to the south end of the shop; the mounting floor, the space from column 26 to the south end of the building.

An air compressor of sufficient capacity to furnish the entire plant with all the air needed was placed in the engine room; this air was maintained at 70 pounds pressure. Jib cranes with direct-acting air-lifts were placed wherever needed throughout the plant.

All castings for the machine shop are placed on a truck by air-lift, and run into the machine shop, and there unloaded by air-lift No. 1 or by the electric crane, as desired.

The engine frames took the following course: First, they were taken from the foundry truck by air-lift No. 1 and piled within reach of air-lift No. 4, by means of which they were placed under drill-press No. 2, where the holes for the studs holding the crank-bearing caps in place were drilled. These caps were fitted and put on by the drill-press hand. The frames were then delivered to boring-mill No. 3, by air-lift No. 4, where the end for receiving the cylinder was faced, and the stuffing-box and crank bearings were bored. All this was done at one setting. From the boring-mill each frame was taken, by means of the electric crane, to planer No. 9. From thence they were delivered to radial drill No. 11, where all the drilling was done. They were then carried to the erecting floor at *E*, within reach of air-lift No. 20.

It will be seen that by this arrangement it was not necessary for any one of the various operators of machines to call on a helper to assist in handling the frames during their journey from the foundry to the erecting floor, although, for a time it was difficult to convince some of the operators that it was possible to handle a piece weighing from 500 to 1,500 pounds and place it in position without a helper. However, they soon learned to use the air-lift with great skill, easily lowering a piece to its position on their machines.

The steam cylinders of all sizes (8x10 and above) were taken from the foundry truck to horizontal boring-mill No. 3. Thence by air-lift No. 4 to planers No. 5, and from there were conveyed by air-lift No. 7 to drill-press No. 8, where they received their final operation and were stored under the overhead trolley No. 12. This trolley was equipped with an air-lift by which the cylinders were carried to the erecting floor when wanted. All other cylinders (7x10 and below) were taken by the electric crane to pulley boring-mill No. 17, where they were bored and the flanges faced by special tools for the purpose. They were planed on planer No. 14 and drilled on drill-press No. 15. They were then placed on a tray at *X* and carried by the electric crane to the gallery over the erecting floor, and were stored near elevator No. 30, which is operated by air.

All flywheels and pulleys were taken from the foundry truck by the electric crane to boring-mill No. 13, and to pulley boring and turning mills Nos. 17 and 18.

Steam-chest covers were delivered by the electric crane to milling machine No.

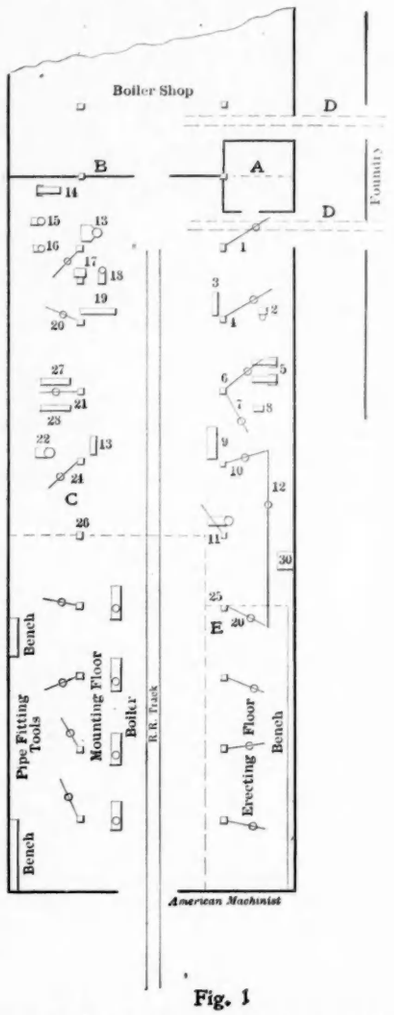


Fig. 1

GROUND FLOOR PLAN OF THE MACHINE SHOP.

13. The crank-shaft forgings were unloaded from the railroad car by the electric crane and were piled at *C*, within reach of air-lift No. 24, which delivered them to slotter No. 22. Thence they were taken by air-lift No. 21 to lathes Nos. 27 and 28, and, after turning, were taken to milling machine No. 13, where the keyways were cut.

All other parts of the engines were sent to the east gallery, where they were machined and kept in store until wanted.

The erecting floor was supplied with jib cranes on each column, each crane having an air-lift. With these cranes it was possible to deliver engines from the trestles on which they were erected to the electric crane, which, in turn, delivered them to the boilers on which they were mounted. The columns on the mounting floor were supplied with jib cranes, each of which was equipped with an air-lift. That part

of this floor extending beyond the gallery was covered by the electric crane; thus every foot of space could be reached either with the crane or air-lifts.

All boilers were brought from the boiler shop by the electric crane and placed, as shown, on the mounting floor.

By the foregoing arrangement the non-producing force of men was reduced 75 per cent. This reduction was accomplished by the proper location of the tools and the use of compressed air and electricity.

The appliances for handling material in use in the old plant consisted, chiefly, of a few chain lifts placed where the heaviest pieces had to be lifted and where the engines had to be mounted on boilers, etc.

All shipping was done by running engines and boilers that were mounted on wheels or skids up a runway on to the cars.

With the old arrangements it took four or five men from one to two hours to bring a boiler from the boiler shop to the machine shop, a half-hour to put the boiler into position to receive its fittings, and forty minutes to turn it over into position to receive the engine.

With the new arrangements, all parts and materials could readily be handled by the mechanics working on them, and without truck or help. A boiler could be brought from the boiler shop and placed in position to receive fittings in five minutes, a man in the boiler shop putting the crane chain around it, and the mechanics on the mounting floor removing the chain when the boiler was lowered into position. Boiler, engine, boxes, smokestack, etc., etc., could be placed on a car and run out of the shop in from fifteen to thirty minutes.

Hereafter a description of methods and tools used, and time required for some of the operations, as compared with the old, will be given. B. W. T.

Letters from Practical Men

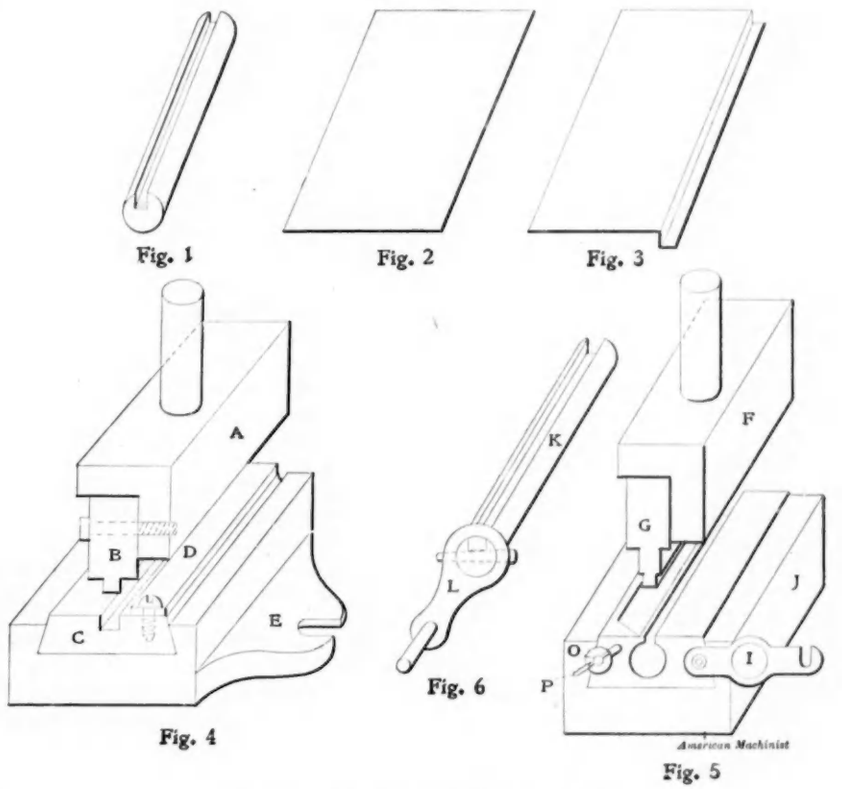
Square Grooved Tube Forming Dies

Editor American Machinist:

I send herewith sketches of a somewhat special and peculiar metal-forming operation which may be of interest to your readers. The job is the forming of a tube to be made of sheet iron, .012 inch thick, to the shape shown in Fig. 1. The finished piece is ⅜ inch diameter outside and 8 inches long, with a groove 3-32 inch deep and 5-32 inch wide running the entire length. It was required to be within .001 inch in all these dimensions.

We figured to do the job in two operations. In the first place, strips of sheet iron of the right thickness were cut to the proper length and squared in the shears (as shown in Fig. 2). They were then ready for the first operation. The tools for this consisted of a punch and die, as shown in Fig. 4, *A* being the punch-holder or stem, of cast iron, and *B* the punch, which was of tool steel and was worked down and finished very smooth, 5-32 inch in width plus one thickness of metal, which left room in the strip for the opposite side to be forced in, and 3-32 inch from the face to sholder plus one thickness of metal. *C* was the die of tool steel, 8 inches long and 2 inches wide, dovetailed and driven into the die-block *E*. *D* was the gage-plate. The die *C* was planed and finished so that when there was a thickness of metal in it the punch would come down and produce a piece like Fig. 3, with two sharp corners, as shown.

For the next operation the punch, die and mandrel as shown in Figs. 5 and 6 were used. The die, of tool steel, was 8 inches long by 2 inches wide, dovetailed and fitted to die-block *J*, with a ⅜-inch reamed hole through its entire length. This hole was lapped and polished very smooth. Then there was a slot milled down its length and running into the hole, as shown in Fig. 5. It was then hardened. The mandrel was a piece of Stubs steel, round, .350 inch in diameter, with a groove milled the entire length, 3-32 inch deep by 5-32 inch plus two thicknesses of metal wide. This was drawfiled very smooth and hardened, leaving the edges of the groove sharp. *I* was the stripper ⅜ inch thick. The stripper *I* is thrown over on pin *O*, and thumb-screw *P* is tightened, which holds it in place. The hole in the stripper must be a nice sliding fit on the mandrel, otherwise it will curl up or bruise the end of the work. It must be made of tool steel and hardened to retain its sharp edge. The mandrel, Fig. 6, is inserted through the stripper into the die, and the handle *L* is turned until a mark placed on the handle corresponds with one on the die, which then shows that the groove in the mandrel is in line with the punch *G*. The strip of metal, Fig. 3, is then inserted into the die from the side, and with the side which has been drawn resting in the groove in the mandrel. The handle *L* is turned one complete turn, which brings it again in line with the punch, which now descends and entering the groove in the mandrel forces the other side of the metal into the groove, thereby completing a tight and perfect grooved tube with good sharp edges and corners. The mandrel is then pulled by hand through the stripper *I*, leaving the tube in the die, from which it is easily removed by throwing back the stripper and pulling it out. Some may think this slow work, but, as they say, results tell; and we certainly got them, there not being the slightest variation in size the entire length, each and every one being the same and a good tight joint. Not only that, but by drawing it around the mandrel it left the stock perfectly smooth and clean; the only thing necessary being a good finish on the working parts, sharp edges on the punches, dies and mandrel, and all carefully hardened and drawn.



FORMING DIES FOR SQUARE GROOVED TUBES.

JOSEPH VINCENT.

Brooklyn, N. Y.

The Healthy Progress of the Automobile.

Editor American Machinist:

It would really seem that there is nothing in sight in the mechanical world more sure than the future of the automobile. It is not, even now, something that is yet to come, for it is here. It is coming along in a most healthy and natural way. It is more of a luxury than anything else now, and it may not get far beyond that for a long time, but it will later become a popular convenience, and then a universal necessity of modern civilization. The other day a lady of wealth with a party of friends visited the New York Navy Yard, and they were conveyed in five automobiles; we hear of many automobile theatre parties, and other similar employments of the revolutionary vehicle. These parties usually make use of the automobile cabs, but, besides these, private vehicles are becoming numerous. A Sunday afternoon walk on the uptown avenues of New York —I am working all the rest of the week— will give a sight of a considerable number of autos of various styles. The other evening I saw a race between a bicycle and a motor carriage, both going much faster than regulation speed.

The motor car is, of course, still in the experimental stage, and much money is being spent upon machines soon to be superseded. Wealth, seeking only its own, is still working to produce ultimately the best and cheapest for us all. The public is clamoring, of course, for "useful" vehicles, for autotrucks that will be cheap and handy for conveying merchandise, for motor omnibuses and such things. It is just as well to be in no hurry about it. The essentials of the pleasure carriage are not different, after all, from those of the truck or delivery wagon, except that they are more exacting as to speed, endurance, comfort and convenience. As the greater includes the less, so does the successful pleasure carriage embody the possibilities of satisfying all the conditions of all lines of service, and those, therefore, who are now working only to produce what they consider the highest class of vehicles are really working for all.

The magnitude of this one task which the modern engineer finds himself confronted with is sufficiently shown in the slowness of his progress towards its solution. A writer was saying in the "American Machinist" only a month ago that an automobile "must, perhaps, be nearly as complicated as a linotype machine, and its invention calls for as much forethought and simultaneous consideration of a hundred eventualities as was expended on the latter before it became so perfect as it is to-day." Surely no one familiar with the linotype machine could for a moment think of comparing the most elaborate automobile of to-day with it, and surely, also, no one can think that the line of progress toward automobile perfection is in the direction of increased complication; and yet the latter part of the above quoted assertion is certainly understated. Vastly more thought and planning will be demanded and expended upon the automobile than was put upon the linotype machine to even approach the satisfactory accomplishment of the proposed results.

The tasks of producing the linotype machine and the automobile are quite different in kind. In the former there were many new things to do, and many new ways of doing things had to be devised. The machine embodies many ingenious and novel mechanical inventions. There is nothing that we are waiting for to put into the automobile. No startling invention is called for, and none probably is coming to solve our problem. All the mechanical essentials are complete and ready to our hand, and combination and adaptation, rather than pure invention, are what is called for. Many of the things, however, have come to hand only within a few years, and especially as to the materials to be used, and the ready parts of the machine in detail. The bicycle has throughout its marvelous development been preparing the way for a vastly greater than itself. The tubing, the wheels and tires, the ball bearings, perhaps the sprocket and chain, the steel for every part, the numerous products of the screw machine—all come in as essentials of the manufactured automobile. The motor is, of course, the central and predominating requisite of the machine, and it is only a matter of choice or of resolute insistence as to which to use. Lighter motors than it is now possible to produce could scarcely be asked for, and economy of fuel for the power developed is also satisfactory. Vehicles employing different types of motors may develop side by side with special advantages for each.

The enthusiastic designer of automobiles may easily be led to forget what is wanted, and the purchasers of the first automobiles also may forget precisely what they want. We want, perhaps least of all, a racing machine. Speed records will never establish permanently any type of machine, because we will seldom be able to use them at high speeds, and will less frequently want to. The typical horse, who has been such a valued helpmate of man, is not the racehorse. Neither is the making of long runs over rough roads the thing alone to be kept in sight in designing the vehicle. Thousands of horses, especially around our cities, never go more than ten miles from home, and never see a piece of rough road. As to running upon rough roads, there may be such a thing as being altogether too accommodating. Let the roads, to some extent at least, be smoothed for the machine, and let not all the concessions be made by the machine. Let us first try to produce serviceable, ever-ready and easily-managed vehicles that will run upon good roads without costing too much, either at first or for repairs, and let us use them and find pleasure and comfort and convenience in them upon our good roads and for comparatively short runs, and when this service is fully established improvements will follow rapidly, until we will be able to go everywhere and do everything with them. The roads will be smoothing themselves to entice the automobile farther and farther from town, until it becomes ubiquitous.

We may expect progress in the development of the automobile in both directions at once. We may build the highest types of pleasure vehicles first, for wealth and leisure to enjoy, and from that we may come down to the larger service of the more numerous classes, while, on the other hand, we may speed up and lighten the traction engine, transforming it successively into the autotruck and the delivery wagon, until the developing types shall meet and fully cover all requirements. The machinist is sure of a good lot of work out of it, anyway.

TECUMSEH SWIFT.

A Good Way to do an Unnecessary Thing—Ground Joints in Engines.

Editor American Machinist:

In your issue of February 8, Mr. Crawford describes his method of grinding engine cylinders and frames together without bringing them near each other. The scheme seems to be novel, and is certainly ingenious. It is an improvement in some respects over the methods used by many builders, and consequently Mr. Crawford deserves more credit than he will get for publishing it. Not all engineers feel like giving away the cute tricks that save money. Part of the assets of any shop consists in these special processes which give some slight advantage over other manufacturers. Their value is so real that it is a wonder some of the experts, in fooling the stockholders of losing concerns, do not use them to pad out their inventories with. They have a better right there than the out-of-date patterns and prehistoric tools with which so many balance sheets are falsified, unwittingly or otherwise. But whatever their value, their ownership is not as precarious as might appear. It is a singular fact that shop wrinkles are very hard to give away, even by publication. There is little or no use trying to guard them, simply because it is so very hard for one man to pick up and put in practice the ideas of another. This feature of human nature limits greatly the good results of the "American Machinist's" work. The bright ideas make interesting reading to all, but they seldom take root. The objections to the other fellow's scheme are so much easier to see than its merits. This question of grinding steam joints is exactly in point. To grind them is general shop practice; yet why not omit the process altogether and bolt them together as they come from the machines?

It has been done with perfect success for over fifteen years, and it is very certain that the joints are better rather than worse for the omission. Probably Professor Sweet was the first to do this; and all straight-line engines have their cylinder heads and steam chest covers bolted on with clean machined surfaces; no packing, no scraping or grinding, no red lead or other dope to make them tight (or leaky) —just clean iron.

The best of all shop kinks is one that leaves off something that is not wanted—that stops doing something that costs money and does not want to be done at all—which is the case here. This is not the first time it has been published; and besides, the entrance to the straight-line shop bears the legend, "Visitors always welcome." Yet engine builders who, had they originated the trick, would either guard it most jealously or else exhibit it to visitors with pride, still keep right on wasting time and money in grinding and scraping joints together. The cylinder of the straight-line engine is cast in one piece with the frame, and there is no joint there, so perhaps this does not exactly match Mr. Crawford's case. In engines built from the designs and under the supervision of the writer—in sizes from 10 to 500 horse-power, and in numbers running into thousands—steam chest covers, cylinder heads and the joints between cylinder and frame, whether with or without an intermediate head, have never been either packed, scraped or ground; they have uniformly been put together just as they come from the machine. There has never been the slightest trouble from leaking, under steam pressures up to 150 pounds. These joints are machined precisely like any other surface; they are not specially prepared in any way whatever, and no special instructions have ever been given regarding care or accuracy in machining them; the only change is that the seat is narrower and the grinding is omitted. In the case of steam chests and steam chest covers the planing is done on any planer convenient, and the covers have even been surfaced on a boring mill when planers were crowded; yet they never leak, unless, indeed, they happen to get badly marred or have an original defect in the casting. There is actually much less trouble in getting a tight joint than with the grinding, and there is also less trouble in maintaining it. A ground joint is quite delicate and will leak on very slight provocation; the machined surfaces will come apart and go tog ther again many more times without giving trouble than the ground ones. A search through the files of the "American Machinist" will bring to light many little-known devices and ingenious schemes that would save money in hundreds of shops; but it is doubtful if any of them are in much more general use because of being published. The case cited is but one of thousands of examples of the conservatism of even the brightest mechanics, and the rarity of the faculty of picking up and making use of the ideas of others.

E. J. ARMSTRONG.

Truing Spring Chucks.

Editor American Machinist:

A job of making some spring chucks or wire chucks for a bench lathe, that I recently did, may possibly interest some of your readers. What I wished to speak of particularly was the method I used to true them after hardening, and while this may not be orthodox, it is like the bug without the wings, it "gets there just the same." Some of the chucks were old ones rebored to larger sizes, while others were new from the start.

The chucks, of course, were finished on the outside first to properly fit the lathe spindle, and the back hole was bored. Then the chuck was placed in lathe and the gripping hole bored about .001 inch under size, and moderately smooth. After splitting the chuck was hardened only as far back as the point *A*, Fig. 1, and left glass hard, without drawing the temper. For holding, I used a pair of light spring tongs that gripped the parallel part of chuck body close to threaded part, and kept chuck turning in the blow-pipe flame, so as to insure an even heat, after which it was plunged vertically into honest water. This usually left the gripping hole slightly larger at the front end than at the back.

In order to get this hole smooth, parallel, true with the chuck body, and to size, I made the lapping fixture shown in Fig. 1. *B* is a brass tube bored out true, so as to be a shove fit on the chuck body, and one end of it turned true with the box. In this end is fitted a piece *C*, which is bored to any convenient size smaller than back hole of chuck, and the part that fits into *B* is turned true with hole in *C*. *D* is the lapping rod, which is a close running fit in *C*, and has a part *E* turned about .001 inch above the nominal size of chuck hole. I used commercial 5-16 inch brass rod for my laps, but it would probably have been better to turn them all over between centers.

To do the lapping, the rod was rotated in lathe by being held by its left-hand end, while the chuck being operated upon was held in the hands and slid back and forth on the lap, the thumb and two fingers of the right hand grasping the conical end of chuck and crowding the three jaws down on to the lap. The oil and emery were fed into the splits of the chuck. The effects of the lapping always began to show first at the back end of the hole, and when the hole was smooth clear to the front end, the lap was usually worn down to the nominal size. If below what it should be, a new one was made, and the lapping continued until that was down to size. I suppose if a fellow wanted to be extra particular, he would have the lap enough un-

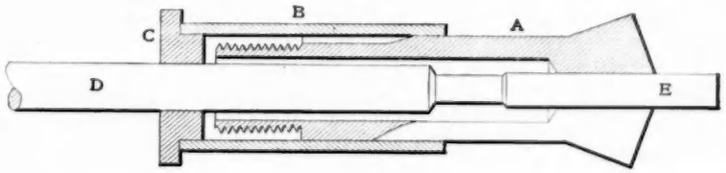


Fig. 1

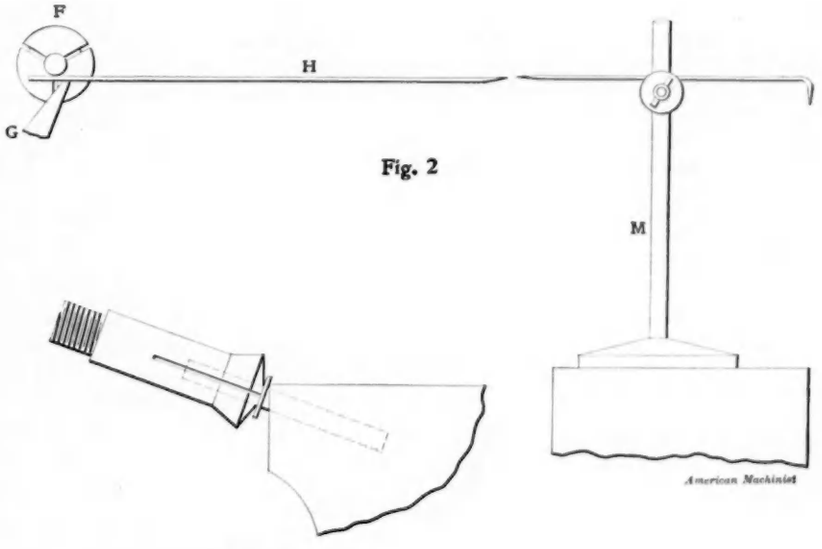


Fig. 2

Fig. 3

TOOLS AND METHODS FOR TRUING SPRING CHUCKS.

der size at the end of the lapping process to allow for a layer of oil and emery all around it, as the hole is a "running fit" on the emery-coated lap, but a tight fit on the wire it is intended to hold. This refinement of sizing did not occur to me at the time I was doing the job, but I shall try to take it into consideration if I ever have any more work of the same sort—although I confess I should not want to use my micrometer to measure the thickness of a layer of emery and oil. However, I might be able to borrow some other fellow's micrometer.

After cleaning the chuck thoroughly of all emery, I put it in lathe and tightened it on a piece of wire of its nominal size. This test wire is best turned, as the commercial wire has slight inequalities of roundness. If the work has been carefully done, the chuck will not run out more than .001 inch. I tested for truth with the indicator shown in your issue of August 15, 1895, but show herewith, in Fig. 2, a method of testing with materials at hand in any shop. *F* is the chuck in place tightened on the test wire. *G* is the top of hand rest, *H* a small piece of square or flat wire, or even a stick would do. *M* is a surface gage standing on a box on the bench, and forms a reference point to tell whether or not the end of *H* moves up and down when lathe is slowly rotated.

The final corrections to make the chuck run true were done by polishing the conical part of chuck with a hand emery stick. A convenient way to do this is to hold a wire of nominal size in the vise, as shown in Fig. 3, tipping it up at the same angle as the cone of the chuck, so the surface being polished will be about horizontal. I rubbed a very thin and even layer of Prussian blue in the cone mouth of the hole in lathe spindle before putting in the chuck, and, when tightened, this marked the parts of the chuck to be polished off, the most of the polishing being done on the side of the chuck adjacent to the "low" spot in test wire as given by the indicator.

This, of course, is a "cut and try" process, but by a sufficient number of repetitions you can get the error so small that your test apparatus will not show it.

WALTER GRIBBEN.

Salary or Wages Expected.

Editor American Machinist:

Hiring a man and buying a machine are very much alike, since both are the buying of something which someone has for sale. If a man advertise for a machine with capacity to perform certain stated functions, and asks that bidders shall describe their machines and state prices, it is considered a direct, sensible and perfectly business-like proposition, and no one would think it useless to try to sell this machine because of being required to state his price with the specifications. It is simply a good method of shortening the time required to complete the transaction. People who buy machinery in this way do not always buy the lowest priced offered; but if two machines are equal, so far as they can judge by the information they have, it is perfectly natural and human that the lowest priced of the two will be selected.

When an employer advertises for a man with capacity to perform certain stated services, and asks that the salary desired be stated, nothing unreasonable is asked, and as no real business can be done until the price to be paid is determined, there is no good reason why this information should not be given at once along with the rest.

It is much more difficult to determine the value of human ability than it is to fix the value of a machine. It is needless to say that it would not be safe to take every man at his own valuation, but when a man gives his own estimate an experienced judge of men might be able to see at once whether or not he wanted more for his services than they were worth.

It would be a revelation to some people to see the answers to an advertisement in a technical paper for a trained mechanic for certain services. Nearly all answers contain evidence from which an experienced employer can make valid inferences about an applicant, and which the applicant had not the least suspicion was conveyed in the application.

Among these the "salary expected" is one of the patent facts, when considered with the other information. If a man enumerates a lot of fine qualities and experiences, and then offers to work for very low wages, it is a pretty safe inference that if he was really possessed of such he would not in these times be hunting a job at low wages. On the other hand, it is not difficult to see when a man is asking much more salary than his statement of experience and ability would justify. So it generally occurs that a first reading of a lot of applications is enough to enable the selection of about one-fourth of the lot as the only ones worth further consideration, and it would be impossible to make such a reduction at once without a statement of the "salary expected."

Of course, a man might be willing to pay his fare a thousand miles and take a job, leaving the question of wages to be settled afterward; but I fear that very often his feelings would be much more strained when he found what wages he was getting than they would be in waiting "for the answer that never came."

Of course, there are some employers who advertise for men with the expectation of hiring the one who offers his services at the lowest price, but if a statement of the "salary expected" will prevent a man from falling into the hands of such an employer I think it is time and postage well spent.

If a man offers his services for a price less than they are worth he will finally meet someone who will give him a job, and if he is content to work for such wages it is no use for anyone else to kick about it.

Good mechanics, with limited business experience and faculty, sometimes underestimate their own value, and if such a one happens to come in competition with a man of equal ability who knows his own value, an employer will select the cheapest man, just as he would the cheapest tool, and I see no reason for blamnig the employer for the action, nor do I see any practical way to prevent such things occurring.

If an employer offers much less than it is worth to fill the position he advertises, he will get the worst of the business, for he will certainly fail to get a suitable man, will waste the money spent in advertising and gain nothing by the operation, while the man who rattles around in the position will probably get better wages for a while than he ever got elsewhere, also some good experience, and perhaps in the end be no worse off.

Getting a job by answering an advertisement is not the same as applying in person, but it has inherent peculiar advantages for both parties, and, on account of the wide distances in this country, it is destined to be used more than it ever has been. If the mechanic who must get a job in this way will be careful to claim only such ability as he really has, and then ask a fair price for it, the "salary expected" advertisement need have no terrors for him.

BELL CRANK.

Good and Bad Practice in Steam Fitting.

Editor American Machinist:

In an article in the "American Machinist," December 21, 1899, entitled "Good and Bad Practice in Steam Heating," Mr. W. H. Wakeman opens the way for a little discussion.

Just why heating by exhaust steam necessarily involves back pressure is not clear to me. The only real use of pressure above that of the atmosphere is to expel the air from the radiators, and from high places in the steam line, thereby establishing a circulation. After this is done all unnecessary back pressure lacks, I believe, a great deal of the value generally attributed to it. By unnecessary back pressure I mean any pressure above what will show on a card taken when the exhaust is open direct to the air.

When steam will not circulate at atmospheric pressure does it not indicate faulty design or a faulty condition of the system? If steam at atmospheric pressure does not afford sufficient heat, is it good engineering or good business to raise the pressure? I think not. A well-designed heating system, embodying steam lines of ample size, having plenty of rise going out and fall coming back, plenty of

good big radiators, fitted with automatic air valves, affords a means of getting all your money back that is refreshing, to say the least. In cases of this kind back pressure used continuously is worse than useless, for the reason that it costs more than it comes to.

Air valves sometimes give trouble from having the minute passages through them blocked with grease and sediment. A very successful cure for this is to immerse the valve bodily in a strong mixture of muriatic acid and water. Half and half won't hurt the valve. Leave immersed over night, and you have a new valve in the morning—only don't put the projecting nipple in your mouth to see if the scheme has worked. I tried that.

Mr. Wakeman's reference to standard steam traps also seems open to comment.

While I have never been interested in the welfare of any particular steam trap, I see no reason why any of the standard traps should fail to do good work if properly handled. Did the flow of steam from this trap indicate a leak, or did it prove one of the natural laws to be a law after all?—in this case the law being that water under steam pressure contains heat enough to evaporate part of the water when relieved of the pressure. If a leak existed, may I be permitted to assume that one of the duties of the stationary engineer is to look after and remove the cause of leaks? Poorly designed steam traps, as well as other things, find their way into the market, but we may be thankful for their short life.

Denver, Colo. E. G. TILDEN.

Planing a Big Engine Bed on a Small Planer.

Editor American Machinist

Seeing quite a number of planer wrinkles in the "American Machinist" lately recalls an incident that occurred about fifteen years ago. We had a bed-plate to plane for a pair of vertical engines, which was about 14 feet long and 4 feet wide. This had to be planed where the engine frames rested on it, also for the journal caps as per sketch. We received bids from two parties—one was $100, the other $120—which were considered rather steep, so I had the job of devising a scheme for planing this, which was done in the following manner: The crossrail was fastened to the front end of platen, and the bed-plate to be planed was lined up on the floor in front of planer and fastened to it by drilling holes in side of planer bed and also in base-plate, and running bolts from one to the other. After loading the platen down with a lot of scrap we were ready for business. The boy who turned the feed screw soon made use of two strings to operate the feed. We had three settings of the job, but finished it in good shape in less than a week. Size of planer, 30 inches by 30 inches by 12 feet. A. MERTES.

Emsworth, Pa.

A Lightning Draftsman.

Editor American Machinist:

The article "The Salary Expected" from Mr. O. Mye, in the "American Machinist" of February 1, contains one paragraph which has set me to thinking, as it well may any man who gets his living by pushing a pencil. The article is dedicated to Mr. Tecumseh Swift, who seems able to handle any subject in an able and interesting manner, and I trust he will pardon me for intruding in this particular case.

Mr. O. Mye says his friend R. secured a position as draftsman with a motor carriage company, and "in ten weeks' time had completed over sixty sheets of working drawings, comprising the parts of four sizes of carriage motors." Now, my figures tell me that over sixty sheets in ten weeks means over six in one week, and better than one sheet each working day for ten consecutive weeks, and I must confess curiosity to know how this was done.

I judge from the article that R. did this work alone, and as the company never had any drawings before, he could not have done any copying, but must, if he did not furnish any new designs or ideas, have measured an existing type of motor, in which case he could make the detail sheets without working up a construction. The manufacture of motor carriages is a very young industry, and it would be interesting to know where the company is located which has started within the age of the motor carriage to manufacture without drawings; and they must have made the motors, for if bought from a motor company ready to mount the working drawings would not have been of any value to the carriage company.

Mr. O. Mye informs us that the sixty sheets included drawings of a 30 horsepower motor for trucking purposes. To the best of my knowledge, the motor truck has not been very extensively developed as yet, so I do not see how there could have been a truck at hand in a state of development to justify copying in every detail, and in the absence of such truck R. must have done some original designing, which calls for some kind of construction before making the working sheets.

The designing draftsman of to-day has to dissect carefully each one of two or

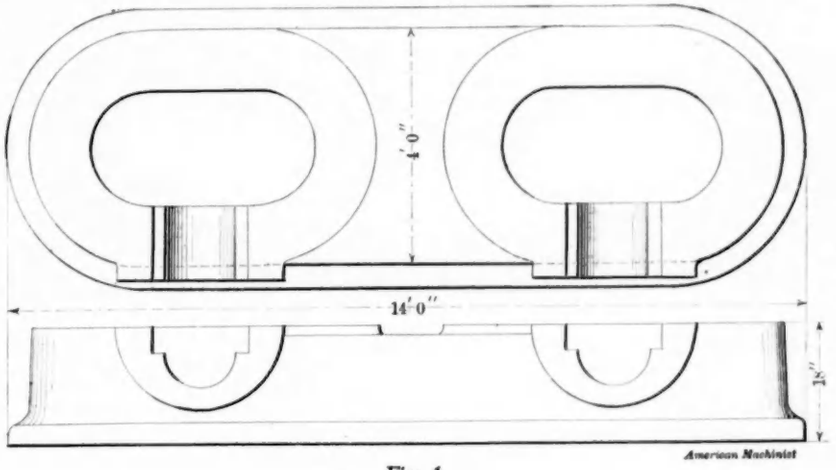


Fig. 1

ENGINE BED TO BE PLANED.

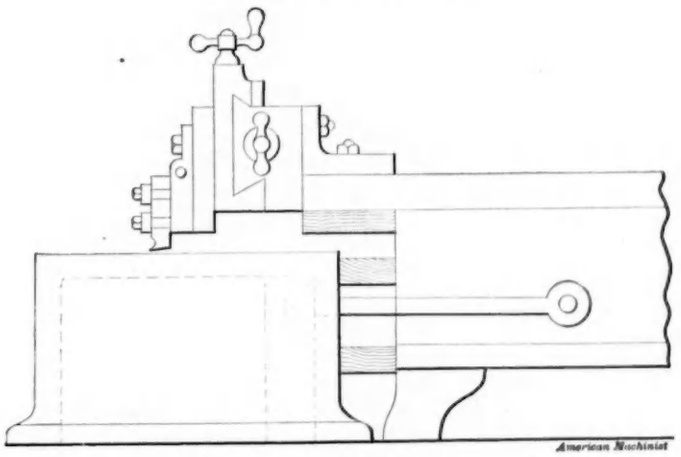


Fig. 2

METHOD OF PLANING THE BED SHOWN IN FIG. 1.

more possible ways of accomplishing the ends desired, and determine which is best suited to the job in hand, and a motor truck in its simplest form must of necessity contain quite a number of mechanical movements, and if R. has successfully accomplished all this in ten weeks he is, it seems to me, a remarkable man, and is justified in looking for a very comfortable salary; as much, in fact, as the average doctor or lawyer expects, whichever way his case goes, and is more than the average mechanic dare hope for.

With apologies to Mr. Swift, I would suggest that R. connect himself with a concern which has a superintendent or at least a mechanic to look after the mechanical end, who can probably regulate the salary with more justice, or at least with some regard for the man's value from a mechanical point of view.

I hope my "Old Man" will not take the article in question as a standard by which to judge my work, for I do not want to look up a job just now, and am afraid to risk the comparison. Can Mr. O. Mye give us more light on the subject?

TEDDY.

Indicator Reducing Motion.

Editor American Machinist:

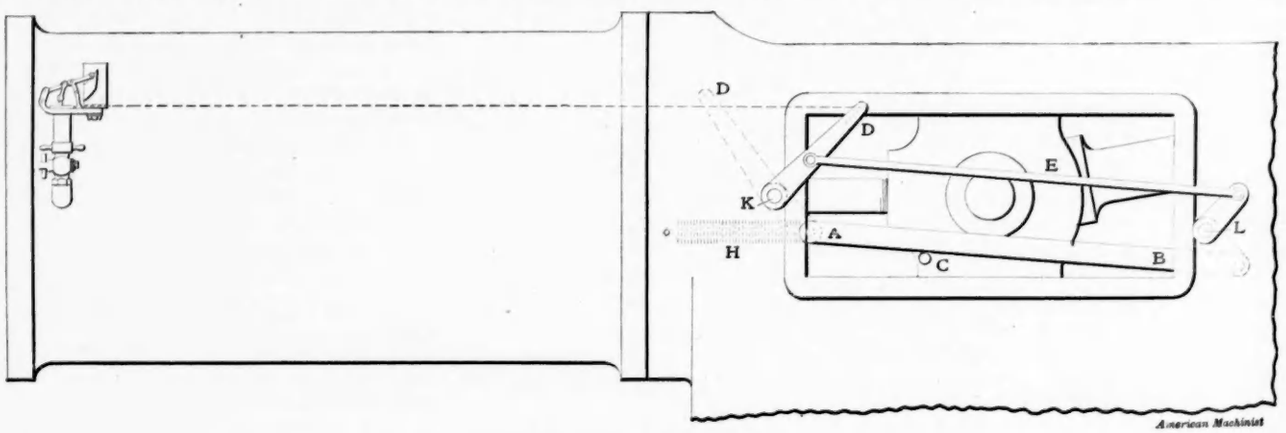
It is an easy thing to make mistakes, but not always easy to turn them to advantage. In designing a closed frame for a double-acting gas engine a door was left in the side long enough to admit the crosshead and to get at the stuffing box gland, but when it came to attaching a pendulum reducing motion, the opening in the frame was found to be too short by several inches. A reducing wheel with the shaft passing through the frame, the small pulley on the outside and the large one on the inside, was tried, but, on account of the high piston speed (900 feet per minute), the string would not remain taut, and then the motion shown in the drawing was devised, and gave such perfect satisfaction and has so many good points that it may be of interest to your readers.

As the indicator connections were on the side of the cylinder, the application of the motion was quite simple. *C* is a pin tapped into the crosshead, and upon this rests and slides the bar *A B*. *K* is a shaft to which the lever *K A* is attached on the inside of the frame, and *K D*, at right angles to *K A*, on the outside of the frame. *L*, placed lower down than *K*, is another shaft passing through the frame, with corresponding levers. The rise and fall of *A B*, as the crosshead travels its stroke, will transmit the correct motion of the crosshead to the indicator through the string attached to *D*. *E* is an outside connection, which keeps *A B* constantly parallel with the same line when it passes the centers. *H* is a spring, sufficiently strong to hold *A B* to *C*, and to overcome the tension of the indicator drum spring.

To stop the drum, pull the string until the arm *D K* assumes the position of *D' K*, which will lock the levers in this position through the center line of pull of the spring having passed by the center of *K*. To start the drum move *D'* ahead until the pull of the spring drops below the center of the shaft *K*.

This device works perfectly at any speed which the engine will run, does not interfere with the door which covers the opening in the frame, and may be left on the engine all the time. Whether the device has ever been used or not I do not know, but I do know that it works better than any other design of reducing motion ever used by me, and, from the fact that it is simple, cheap, always in place, and that a perfect diagram can be taken at any time without stopping the engine or getting covered with oil, it ought to be highly appreciated by the progressive engineer.

C. E. SARGENT.



REDUCING MOTION FOR INDICATOR.

Novel Use of a Template.

Editor American Machinist:

Not long ago I sold an engine to a large printing house here. They insisted upon having the foundation laid—that is, having it done, instead of letting me do it. I finally consented, but insisted upon making the template, which I did, of course, taking care to have it very accurate. With this and a drawing I thought surely they would have the bolts in correctly, etc. A week later they sent for me, saying that the foundation was settled and hard. As soon as I saw it I knew something was wrong; it was all out of line, to say nothing of the bolts. I called for the template. The young manager came and said they couldn't understand what I wanted. I explained that it was the pine template I wanted; then the manager said, "Why, Mr. ——, it is down at the bottom; I had the foundation built on it." It is needless to say they didn't save money on that job.

A. Z.

Help Wanted Advertisements as an Indication of Prosperity.

Editor American Machinist:

If "Help Wanted" advertisements are an index of prosperity, how about the "Situations Wanted" in same column? In two papers of January, 1898, we find 26 want situations, and in same two papers 16 want help. In two papers of January, 1899, we find 28 want situations, and in same two papers 13 want help; while in first two numbers of January, 1900, 30 want situations and 29 want help. So you see the supply is still greater than the demand.

EZRA ESTEP.

Sandwich, Ill.

[Of course, it will be understood that we do not base our belief in the existence of good times in the machine business solely upon the "Help Wanted" advertisements; we have much other evidence. Nevertheless, we do think the advertisements referred to do show that very many machine shop proprietors do not readily get as many good men as they need. We have reason to believe that in some cases, at least, the men who advertise for situations are not out of work, but seek to know if there is such a demand for men as will enable them to better the terms of employment. Proprietors are not advertising for men for an analogous reason, because, for one thing, most of them know

that at present there would be no use in doing so. There have been more "Situation Wanted" advertisements of late than formerly, but we think no one acquainted with the machine business would conclude from that that more men are out of positions or that times in the machine business are not so good as, say, in '96.—Ed.]

Manufacturers.

Work has been commenced on buildings of the Empire State Sugar Company's beet sugar factory, Lyons, N. Y.

A site in Scranton, Pa., for an electro-chemical plant has been sought for by I. L. Roberts, of New York City.

Capitalists are erecting, at Bedford, Ind., a factory to cost $200,000, for the manufacture of Portland cement from oolitic limestone.

The Neafie & Levy Ship & Engine Building Company, Philadelphia, Pa., is to have a two-story brass foundry at 462-464 Allen street, that city, to cost $2,500.

A $6,000 textile mill will be erected on Worth street, above Oxford, in the Twenty-third Ward, Philadelphia, Pa., for Joseph Green, owner, by Contractor Joseph Courtnell.

The Brown & Bailey Company, Philadelphia, paper box manufacturers, are to erect a five-story and basement, 17x70-foot addition to their factory at Franklin and Willow streets.

Indications are that the shop formerly occupied by the Wheel & Cycle Bar Company, at Wallingford, Conn., will be used as a spoon factory by G. M. Hallenbeck, formerly of the Hall-Elton Company.

The Roanoke (Va.) Electric Company is considering the improvement of its power-house. At the instance of James F. Hayward, it has been inspected for that purpose by Henry Brauns, architect, of Baltimore.

It is stated that the Big Four Railway Company has awarded the contract for the construction of a building at Columbus, O., costing $350,000, to be used as a shoe factory, and to give employment to 450 or 500 hands.

Architect Joseph M. Huston will revise the plans for the big factory building which it is proposed to build at the northeast corner of Broad street and Washington avenue, Philadelphia, Pa. The site is owned by John Wanamaker.

Capital is being subscribed toward the erection of a cotton mill in Hillsboro, Tex. A. N. Evans, secretary of the Texas Real Estate Association, Fort Worth, is promoting the enterprise, and is connected with other manufacturing projects.

The Pittsburgh Reduction Company, according to one report, has let contracts for the construction of a new plant on the Canadian side of the Niagara river, and according to another report has decided to erect a large plant at Montreal.

The Citizens' Light, Heat & Power Company, Colorado Springs, Col., is having plans drawn and is making complete preparations to begin the erection of a plant just as soon as the franchise is ratified at the coming election. About $225,000 is to be expended in equipment.

In building the power-house at Wilton, N. Y., of the Greenville & Coxsackie Traction Company, a 15 horse-power engine will be used for drilling and blasting at the quarry. Six boilers, weighing 33,000 pounds each, and two engines of 350 horse-power each have been ordered.

Incorporation papers have been filed in New Jersey of the American Sash & Door Company, with a capital of $6,000,000. This marks another step in the deal for a consolidation of manufacturers in the sash, door and blind trade, which has been under way for about a year.

E. C. Atkins & Co., manufacturers of saws, etc., Indianapolis, Ind., are having built a

(*Continued on page 42.*)

SAVE TIME, TROUBLE AND MONEY.

When you want a reliable and competent Engineer, Superintendent or Draftsman, **write us,** stating fully the requirements of the position to be filled. . . . . .

You will then be put in communication with **THE RIGHT MEN FOR THE POSITION.**

THE ENGINEERING AGENCY,
1605 Monadnock Block, - CHICAGO, U. S. A.

TAKE IT ON TRIAL

Use it for 30 days, then keep it or send it back, just as you like. If you can test it with the best of other oil filters, all the better. That is the way we sell the **CROSS OIL FILTERS**—the way we've sold them to many of the largest concerns in the world.

Send for Catalog 16.

THE BURT MFG. CO.,
255 Main Street,
AKRON, OHIO, U. S. A.
Largest Manufacturers of Oil Filters in the World.

We Like to Figure

on the making of special tools and fixtures. Some people can make lower figures, but not on the same quality of work.

Grant Mfg. Co., Bridgeport, Conn.

"Gisholt" Turret Lathe

Size "H"; swing 21 in. over ways, complete; latest pattern; used 5 months; practically new; immediate delivery.

J. J. McCABE,
14 Dey Street, - - - NEW YORK.

WANTED.

Responsible parties to build
Automatic Duplex Forming Machines.
Apply to Box 213,
AMERICAN MACHINIST.

WANTED.

Two Automatic Screw Machines

HARTFORD PREFERRED.

Must be in good condition and at a bargain.

Norwood Bicycle Co., Cincinnati, O.

IF you are looking for a place to get Special Screws made to order, and want good work, write to

Reed & Curtis Machine Screw Company,
WORCESTER, MASS.

VALUABLE BOOKS.

Everyone who is in any way interested in Mechanics will find it to their advantage to immediately procure the new book entitled,

MECHANICAL MOVEMENTS,
Powers, Devices and Appliances.
By Gardner D. Hiscox, M. E.

Over 400 pages. Large octavo. 1040 specially made illustrations, with full descriptive text.

Price, $3.00.

This work is practically a complete mechanical education, commencing, as it does, with a rudimentary description of the first known mechanical powers, and gradually tracing up the history of mechanics and appliances to the present day.

It fully illustrates the leading devices for the transmission of power and its measurement. It exhaustively describes every known motive power in the world, deals with the principles of construction in electrical appliances, treats of the horseless carriage and bicycle movements, minutely describes every known kind of machine, both large and small, gives their various uses and method of construction, and, in short, presents a copious dissertation on mechanics, powers, devices and appliances.

It is a book which every machinist, inventor, student, mechanic, draughtsman, engineer, electrician, and everybody interested in the devising and operation of mechanical works, should have in his possession. As a handy book of reference it is without a peer.

A special illustrated circular mailed on application, or the book prepaid to any address in the world on receipt of price.

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And the Liquefaction of Gases.
By T. O'Conor Sloane, A. M., E. M., Ph. D.

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Price, $2.50.

This book contains the full theory of the subject and the entire history of the liquefaction of gas, from the earliest time to the present.

GAS, GASOLINE and OIL ENGINES,
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270 large pages, 8 vo, illustrated with 208 handsome engravings. Third revised and enlarged edition.

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The only American book on an interesting subject. Full of general information about the new and popular motive power, its economy and ease of management. Also chapters on Horseless Vehicles, Electric Lighting, Marine Propulsion, etc.

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By John T. Usher, Machinist.

257 engravings, 322 pages. Third edition, enlarged

Price, $2.50.

A new book from cover to cover. It contains everything that the up-to-date machinist should know about his business. Practical, instructive, exhaustive. A valuable addition to the library and a reliable text-book for the machinist.

"SHOP KINKS,"
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Nearly 400 pages, 222 engravings.

Price, $2.50.

It shows special ways of doing work better, quicker and cheaper than usual. It is full of pointers as to how work is done in the best American and European shops. It bristles with valuable wrinkles and helpful suggestions. It will benefit all, from apprentice to proprietor Every machinist, at any age, should study its pages.

NEARLY READY.

Horseless Vehicles, Automobiles and Motor Cycles, by Gardner D. Hiscox; and **Gas Engine Construction,** by Parsell & Weed.

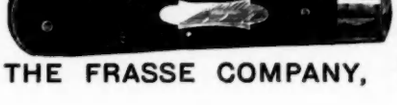
Any of the above books sent free to any part of the world on receipt of price, or a special circular mailed free on request. Our 96-page catalogue, embracing works on every practical subject, mailed free, on application.

NORMAN W. HENLEY & CO., - Publishers,
15 Beekman Street, NEW YORK.

A CHEAP KNIFE

No. 2730 or 1060. Strong knives, 3½ inches long, 2 forged steel razor blades, coco, ebony or stag handle. Just the knife for pattern maker or machinist for cutting gaskets patterns, belts, etc. Each, 75c. postage paid. Send 2 cents in stamps for List of Cutlery and Model Engine Fittings.

is one that serves its purpose; must keep sharp and keen How annoying to be constantly running to the grindstone.



THE FRASSE COMPANY, 38 Cortlandt Street, NEW YORK

(*Continued from page* 41.)

large three-story factory building, which is to be completed within ninety days. The building is to be located on South street, between Illinois and Capitol avenue, and will be fireproof. It will cost about $30,000.

J. L. Baker, who is at the head of the Baker Plaster Company, doing business at Omaha, St. Paul and elsewhere, and who operated the stucco plant at Hot Springs, S. D., for a few years, has decided to build a new stucco manufacturing plant there. J. M. Breisford recently purchased the old stucco plant at that place.

A three-story brick and iron manufacturing establishment is to be erected at Ocean Grove, N. J., on a site recently granted by the Board of Trade of Asbury Park, to the Symphonian Manufacturing Company, of New York. The main building will measure 40x200 feet, and contain latest factory appliances and appointments, costing about $25,000. W. C. Cottrell has the drawings in charge.

Wilson Bros. & Co., Drexel Building, Philadelphia, Pa., have completed plans for the big car and repair shops for the Philadelphia & Reading Railway Company to be built in Reading. Stacey Reeves & Son, 1611 Filbert street, and Doyle & Doak, 1509 Sansom street, are figuring on the work. The elevations show a one-story structure of steel, brick and terra cotta, 750 feet long.

William Cramp & Sons' Ship & Engine Company will build a three-story iron and brick power-house, 60x70 feet, at Plum and Claiborne streets, Philadelphia, Pa. The Hoffman Engineering Construction Company is doing the building. It is also building for the above named firm a three-story brick and iron machine shop, 28x142 feet, at Richmond and Norris streets, that city. These buildings will cost $60,000.

A syndicate has purchased the Stewart mill property at Little Falls, N. Y., and has decided to construct a large building about 160 feet long. The raceway that supplies the water for the Herkimer County Power Company extends through the property. It is proposed to cover this raceway with iron stringers and build the new structure over it. The new building will be three or four stories high, and the first and second floors will be constructed with a view to leasing the property for a machine shop, carpenter shop or light manufacturing.

NEW CORPORATIONS.

White Gin & Mill Company, Brandan, Tex.; cotton ginning; capital, $25,000; incorporated, Texas.

C. F. Wolff & Son, Chicago, Ill.; manufacturing paper boxes; capital, $35,000; incorporated Illinois.

Manhattan Filter Company, New York City; manufacturing filters, etc.; capital, $20,000; incorporated, New York.

Durst Manufacturing Company, Chicago, Ill.; manufacturing machinery; capital, $5,000; incorporated, Illinois.

Mississippi Lumber Company, Chicago, Ill.; manufacturing and dealing in lumber; capital, $150,000; incorporated, Illinois.

Consolidated Electric Lamp Company, Kittery, Me.; manufacturing electric lamps; capital, $100,000; incorporated, Maine.

Fort Dodge Beet Sugar Company, Fort Dodge, Ia.; authorized capital, $450,000. It is hoped to erect a factory ere long.

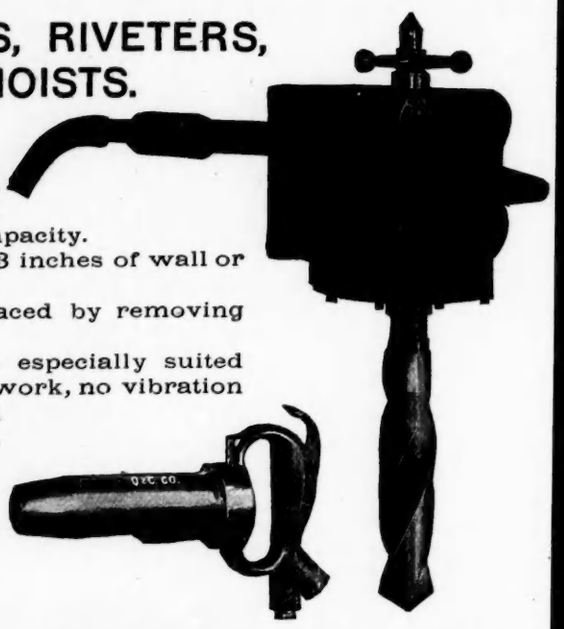
William B. Phinney Company, New York City; manufacturing candy machinery; capital, $5,000; incorporated, New York.

Streeter Brake Shoe Company, Chicago, Ill.; manufacturing and dealing in metal castings; capital, $50,000; incorporated, Illinois.

(*Continued on page* 43.)

PNEUMATIC TOOLS

HAMMERS, RIVETERS,
DRILLS, HOISTS.



OUR B DRILL
weighs 40 lbs.
Will drive 3 in.
drill up to its capacity.
Drills within 3 inches of wall or corner.
All parts replaced by removing cap.
Hammers are especially suited for machinists' work, no vibration and great speed on cast iron and steel.

THE Q AND C

THE Q & C CO.,
CHICAGO, NEW YORK.

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SMITH & MILLS,
CINCINNATI, OHIO,
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12 TO 32 IN. STROKE

FACTORY SITES

RIGHT IN THE HEART OF PHILADELPHIA.

Extraordinary opportunity for locating large or small factories in Philadelphia. Tract at 26th and Point Breeze Ave.; over 2,000 feet frontage on the Pennsylvania and Baltimore & Ohio railroads. Another desirable site at Germantown and Walnut Lane with 400 feet frontage on the Philadelphia & Reading Ry.; the only site available for factory purposes in that section. Open all around; frontage on two main streets; natural basin, little or no excavating necessary.

A particularly choice site at Wayne Junction on the same railroad. Size 114 x 200. An industrial section of national importance; 280 trains daily.

Also a tract of 150 acres on the Philadelphia & Reading Ry., 11 miles out; **one mile and a half of railroad frontage;** direct communication to New York via the Main Line, and all points on the Reading System; three stations on the grounds; excellent accommodations for the transfer of freight to the Pennsylvania and other railroads; ample room for sidings and switching.

This tract immediately adjoins the largest and best improved residential suburb in the country—Glenside Highlands—which we have laid out at an expense of OVER TWO MILLION DOLLARS; 44 trains each way daily to and from Philadelphia; fare 10 cents.

It is the only large factory site outside the limits of a metropolis where water, gas and electric lighting can be supplied and connections made with a perfect sewerage system.

We want to hear from progressive companies or individuals who contemplate erecting factories or who are dissatisfied with their present location.

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